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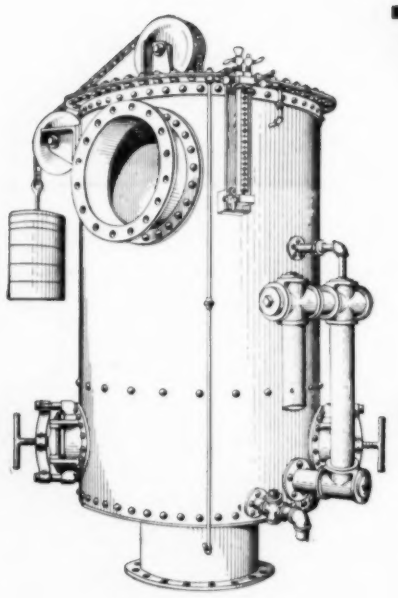
A TAR EXTRACTOR THAT EXTRACTS



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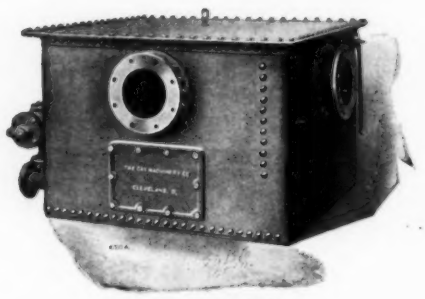

WET TYPE.

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THE PLANNING OF LIGHTING INSTALLATIONS.

ROBERT FFRENCH PIERCE.

In determining the kind of lighting installation to be provided for any purpose, there are three general factors to be taken into consideration:

I.—Physiological and hygienic requirement. The effectiveness of the light provided, for producing illumination of a quality that will permit the eye to perform its functions satisfactorily and without strain or discomfort.

II.—Economic requirements. The avoidance of useless waste of energy in the production of the light and its utilization.

III.—The effect from an artistic standpoint.

The evil effects of improper lighting have received a great deal of attention in recent years, but they are still greatly underestimated. This is largely because most persons seem to think that any substantial injury to the bodily organism must be accompanied by acute and persistent pain. The physician and the oculist, who can speak most authoriatively upon this subject, usually clothe their opinions in such technical language that they are either not understood, or what they say regarded as the fruit of theoretical speculation rather than practical experience.

From a purely common-sence standpoint, there is plenty of reason to expect that the modern development of artificial illuminants will produce disorders and weaknesses of the eyes. Like every other organ of the body, the eye has undergone hundreds of thousands of years of evolution, by which it has become fitted to perform its functions under certain conditions characteristic of its environment. It is, therefore, not injuriously affected by light of the quality emitted by the sun, and of the sun, and of the intensities usually found under the habits of life naturally followed by the human animal. On the other hand, it has not adapted itself to, nor protected itself against all the conditions that may be brought about by the use of artificial illuminants.

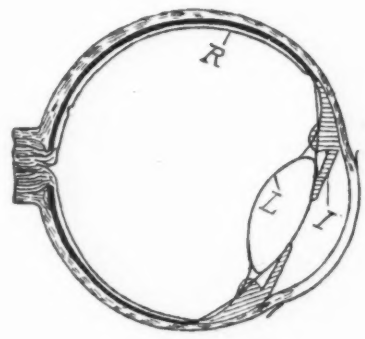


Fig. 1.

To understand just how and why the eye is injured by excessive or improperly distributed illumination, it will be necessary to gain some idea of the mechanism of *sight*.

The eye is, to all intents and purposes, an automatic camera (Fig. 1) equipped with a lens (*L*), a diaphragm or iris (*I*), and a sensitive surface or retina (*R*).

In the camera the light rays are "focused" upon the sensitized plate by moving the plate toward or from the lens; in the eye, however, the form of the apparatus is fixed by reason of its confinement in the bony skull cavity, and focusing is accomplished by altering the *curvature* of the lens by the ciliary muscle surrounding it. Another point of difference from the camera is that the retina of the eye receives a transitory impression, instead of undergoing a permanent change as on the photographic plate. In all other essentials the instruments are quite similar. Both have diaphragms which may be opened to admit more light under weak illumination, or reduced in size to cut down excessive light under high intensities. The effects of different degrees or distributions of illumination, or of brightness, are also quite analagous. Insufficient brightness of the object to be seen or reproduced makes it difficult to register an impression upon either photographic plate or retina. Excessive brightness makes it possible to clearly distinguish details with either instrument. Excessively bright objects are shown on the photographic plate as formless splotches of light (Fig. 2); to the eye they present a similar appearance.

This same figure also shows the results of too great a difference in distribution of light over the field of vision. If the photographer had reduced the opening of the diaphram sufficiently to cut down the excessive glare from the arc lamps, all else would have appeared in darkness; so he sacrificed clearness of detail in the light source to show the effect of the illumination upon the street. In viewing the scene, the eye would be strained between an attempt to cut down the excessive light from the glaring lamps and to distinguish the details of the lighted surfaces; for the iris opening necessary to reduce the glare of the lamps to a comfortable point would be quite insufficient to enable the eye to distinguish details under the low illumination received by the street and buildings. While the eye can adapt itself temporarily, at least, to a comparatively large range of brightness covering the entire field of vision, the limits of relative brightness, or *contrast in the same field*, that it can tolerate are comparatively small.

There are also many other factors that must be taken into consideration. Surroundings play an important part. The eye can endure an outdoor illumination under direct sunlight that would be speedily destructive if furnished from a shaded reflector in a dark room. The manner in which excessive brightnesses injure the eye may be readily understood by considering the action of the retina under light. The sensation of sight is due to *definite chemical changes*. The retina contains a chemical substance, known as the "visual purple," that is destroyed by light. The eye is able to build up this substance at a certain rate, and it is the effort of the eye to furnish the visual purple that produces the sensation known as sight. If only a *very* dim light falls upon the retina the visual purple is detroyed slowly, and hence built up slowly, and this slight effort produces no sensation, or a very feeble one. It is this lower limit of sensibility that determines the degree of illumination the eye can detect. The more intense the illumination, the more rapidly the visual purple is destroyed and replaced, and the more acute the sensation. If the illumination is so intense that the visual purple is destroyed more rapidly than it can be replaced, fatigue or injury results, temporary or permanent, according to its severity.

Eyesight may be impaired through subjecting the eye to excessive degrees of illumination; or to excessively bright points in the field of vision; or to inadequate illumination, resulting in nervous strain; or to wavering or unsteady illumination, resulting in muscular strain due to the attempt of the eye to follow the changes in illumination. Different parts of the retina possess different degrees of sensibility, and a degree of brightness that would be bearable in certain positions in the field of vision might be altogether intolerable in others.

The laws governing the relations between the eye and illumination are too complex to be fully set forth within the scope of this paper; and the student will find it best to follow the rules for de-

signing lighting installations laid down in the following paragraphs.

These rules are the results of careful study and practical experience of competent investigators, and are much safer guides than the casual judgments of an untrained observer. It often happens that serious eye troubles result from lighting installations that, by reason of lack of experience with anything better, appear to the casual observer, or even to those working under them, to be free from fault.

Just as the microscope will detect disease germs that would pass the palate unsuspected, so an analysis of the requirements of the eye will disclose sources of annoyance, discomfort and impaired vision that would entirely elude the senses.

Fig. 2.

Unfortunately, the requirements of good illumination cannot be stated in such precise and measurable terms as to permit the laying down of hard and fast rules that would govern in every case; they may be stated only in general terms.

The first requisite is obviously sufficient light for the particular purpose and under the particular conditions for which it is needed. But the proper or necessary illumination for any one purpose will vary with conditions. A certain amount of light on a reading page may be sufficient where the surrounding walls are light, but entirely inadequate where they are dark, because the contrast between the bright page and the dark wall is objectionable.

The limits of brightness in the field of vision that are comfortable, or even tolerable, are a matter of contrast rather than of absolute values. Out-of-doors, the brightness of the sky is not at all objectionable; the same sky viewed from the interior of a room may be very obnoxiously bright, as any one who has tried to work at a desk facing a large north window can testify. The frequently expressed dictum that $2^1/_2$ candle power per square inch is a permissible brightness for luminous sources, is based upon the fact that this is about the brightness of the north sky, the assumption being that anything that occurs in nature must of necessity be not only harmless but perfect. There is as much reason in this as in the slogan of the patent medicine faker—"No poisonous drugs—purely vegetable"—the absurdity of which is apparent to any one who knows anything about the origin of strychnine, morphine and prussic acid. But without endeavoring to make fine discriminations, we may at least lay down the principle that the tungsten filament with its 1000 candle power per square inch, and the incandescent gas mantle with 60 to 90 candle power per square inch, are both so far beyond the limit of human endurance as to require effectual screening before being permitted in the range of vision. In general, it may be said that any installation in which the eye, in the ordinary course of observation, may rest upon a bare filament or mantle is inexcusably bad, beyond the possibility of argument.

Nor is the mere enclosing in diffusing glassware evidence that the objectionable brilliancy is adequately reduced. An example of this is the electric flaming lamp with diffusing globe, placed 8 or 10 feet above the sidewalk. The brightness of these globes is about 40 c. p. per square inch, half that of the gas mantle. The mere fact a globe is "diffusing" is of no importance unless we know whether or not the diffusing does what is desired of it—reduces brightness to within tolerable limits.

Generally speaking, we may say that light sources are excellent in inverse proportion to their brightness—the brighter they are, the worse they are—assuming of course that sufficient light is delivered where it is required. These two requirements may be met at the same time by the simple expedient of increasing the size of enclosing glassware. In fact, the virtues of the semi-indirect system of illumination lies mainly in the securing of low brightness by increasing the size of the enclosing bowl. Similarly, the merits of the indirect system are derived from the diffusing of the light from a very large surface—the ceiling—instead of a small one. Precisely the same results would be obtained by *direct* light through a diffusing artificial skylight; and likewise all the benefits of the semi-indirect system would be obtained by increasing the size of direct-lighting glassware to a sufficient extent—for instance, by using with the single mantle small inverted unit an opaline globe of, say, 16" in diameter. In other words, the indirect and semi-indirect systems are mainly mechanical expedients for reducing the brightness of the light source.

The object of decreasing the brightess of the light source is to reduce the excessive contrast between the source and other portions of the room. While it is true that a certain amount of contrast is desirable, it is equally true that with any of the lighting units now available or likely to be available, there is not even the most remote danger of *insufficient* contrast being obtained, at least in connection with any problem within the scope of any but the specialist.

A safe practice for the salesman to pursue, is to attempt in all cases to install the equipment in which the light source shall have the *least possible brightness*, consistent, of course, with sufficient illumination—in other words, the individual globes and shades should be of the largest sizes practicable. It will seldom be possible with the commercial glassware now on the market to reduce the brightness to the extent really desirable, except by resorting to the semi-indirect system of illumination; and indeed, it is this fact that is responsible for the great vogue and rapid spread of the indirect and semi-indirect systems—the imposibility of obtaining relief from obnoxious degrees of brightness by using any of the commercial reflectors furnished for direct lighting.

Although the light source may be effectively screened from the eye, it will produce the objectionable feature known as *glare* from the surface of glazed papers, etc. Such surfaces act as mirrors by virtue of the regular reflection from the glazed surface, and a blurred, but quite brilliant, image of the light source appears. The brighter the light source, the brighter the image will be and the more obnoxious the resulting glare. It is for this reason that the shading of incandescent gas and electric lamps by open bottom reflectors usually fails to produce satisfactory results in the lighting of offices, etc. The shading of lamps by such reflectors has no influence whatever upon the production of glare from glazed papers and other regularly-reflecting surfaces.

It is the smaller amount of "glare" from the less brilliant gas mantle, that is responsible for the lesser fatigue experienced in reading under a shaded incandescent gas lamp than under a similarly shaded electric incandescent lamp. This effect is a matter of common experience, and has been quite generally noticed. All sorts of opinions and theories have been advanced in explanation, some enthusiastic adherents of gas lighting even ascribing it to some quality in the light itself. The perfectly obvious explanation does not appear to have received a great deal of attention.

Outside of color (or quality, very loosely so-called) of light, the importance of which has not been conclusively demonstrated, the above considerations are all that enter directly into the excellence of a lighting system with reference to ease of vision, and the health of the eye. In addition to these, however, another feature, and a very important one from the commercial standpoint, is artistic effect.

The average purchaser of lighting appliances is not so much interested in securing facilities for performing a certain kind of eye-labor, as in providing himself with pleasant surroundings; and personal tastes must be met before the physical requirements of illumination may be considered.

The primary purpose of clothes is protection against cold, yet no one seems to have suggested that all clothes be made of one standard material of one pattern and color, and cut in one standard style, which represent the minimum expense in material and workmanship. Neither will much success attend the salesman who attempts to sell lighting appliances with a single eye toward simplifying stock records in the storeroom.

It is impossible within the limits of this paper to discuss aesthetic or artistic considerations at length; it is only necessary to call attention to the importance of these considerations and emphasize the necessity of giving them due attention.

(Continued from Page 309.)

THE PRESENT PRACTICE OF GAS DISTRIBUTION BY BRITISH UNDERTAKINGS.

From paper by WALTER HOLE, to the International Gas Congress.

High Pressure Gas.—It is little more than 10 years since high pressure gas distribution was brought prominently before the British gas profession by the pioneer work of Mr. George Helps, of Nuneaton. The early work in the United States was recorded in a paper given by Mr. Robert M. Searle, of Rochester, N. Y., before the Institution of Gas Engineers at Dublin in 1907, under the title "High Pressure Distribution Developments in the United States." There are few, if any, undertakings of importance that cannot boast of high pressure installations. In the *Journal of Gas Lighting* for March 31 and April 7, 1914, two lists of towns having high pressure mains were published, the total reaching to no less than 111. These lists did not pretend to be inclusive, and another 8 or 10, should be added. They do show, however, how very common and widespread the use of high pressure gas has become.

The early installations were small, tentative and rather experimental; it being in accordance with the genius of the British race that advance into such an unknown field should be cautious. New conditions had to be encountered, new factors understood, new problems solved. It is impressive testimony to the inherent advantages of the system, that it has become, in such a comparatively short time, so valuable an adjunct to the methods at the command of the distributing engineer.

Town Migration.—Perhaps one reason of this was that the movement came at a most opportune time. The last 20 years has been a period of considerable residential migration from the center to outskirts of cities, even overflowed into the neighboring villages and country districts. This migration was largely brought about by the great industrial development in the large towns, and made possible by the provision of cheap and rapid passenger traffic by extension of electric tramways, and short railway journey facilities. The demand for gas supply to these sparsely peopled suburbs soon become claimant, and has been successfully and economically met by high pressure supply.

Uses of High Pressure Gas.—Where pressures vary from a few inches head of water to more than as many pounds per square inch, a satisfactory definition of high pressure supply is not easy to find. Failing any better we may construe the term as applicable to pressures beyond the capacity of the gas holder to throw, and which, therefore, requires the use of auxiliary apparatus for compression. Accepting this definition we may say that high pressure gas is being used for four purposes, viz.:

I. For the supply of storage holders at distributing stations.
II. For boosting the low pressure system.
III. For direct supply to consumers.
IV. For belt line reinforcement of pressures.

Supplies to Storage Holders.—The movement from congested centers to the suburbs has enormously increased the demand upon the out-stations. Mains and plant quite adequate under former conditions have now become quite overworked. In order to keep the holder supplied it is frequently necessary to keep engines and compressors going for weeks at a time during the winter months with but the shortest breaks possible. In many cases very heavy expenditure on mains has been avoided by providing auxiliary apparatus for driving gas forward at greater pressures. In this way the supply from works to out-station has been increased out of all proportion to the additional expense incurred. An example of such a use of a high pressure main is the 48″ line of the Gas Light and Coke Company, used for the transmission of gas from the Beckton Works in the East to Fulham in the West and Stoke Newington in the North, for the double purpose of filling gas holders and boosting the low pressure mains enroute. Other examples on a smaller scale are fairly common.

Boosting.—The most common use in this country is to boost or reinforce the supply at various points in the ordinary low pressure distributing system.

Formerly, there would have been no solution of the problem of the out districts except further provision of distributing stations with large expenditure for adequate mains. But high pressure gas puts another tool in the hands of the engineer. By moderate expenditure for a compressing plant which occupies but little ground space; by providing at comparatively slight cost the necessary governors; by laying the necessary mains which may be of much smaller diameter than formerly, the life and usefulness of the outgrown canalization is indefinitely prolonged. Existing systems that would be exceedingly costly and inconvenient to relay, even in part, are given a new lease of life.

Flexibility of System.—One of the most attractive features of a good boosting system is its flexibility. Once installed it may be very largely extended, and the carrying capacity of the feeder mains may be greatly increased by working at higher pressure. Take a simple illustration. In Leeds we are just carrying out a scheme for the transmission of 1,000,000 cubic feet of gas per day through a main over 2¼ miles in length. It may be necessary in a year or two to transmit as much as 3,000,000 cubic feet per day, but the same main will be used, and the same final pressure will be maintained. The additional delivery will be obtained by increasing the initial pressure to give the desired discharge. But more than this, a good boosting system gives the engineer control of pressures in his low pressure distributing system that he can obtain in no other way. At times of low demand the booster may be closed down; when the output is moderate the boosting plant may be worked accordingly. At times of maximum demand the speed of the compressors may be increased to meet the need. By suitable arrangements these needs may be registered at the compressing station so that the attendant is made aware at once of any abnormal conditions. Or better still, the speed of engines and compressors may be regulated by the conditions obtaining at the delivery end, so that the supply is automatically controlled by the needs of the moment. It would be difficult to conceive any system so well adapted to meet the present highly fluctuating demands in particular districts in many areas of supply.

Economy on Mains.—Just a word on the score of economy. Reference has above been made to a main being laid for a present transmission of 1,000,000, with a possible future transmission of 3,000,000 cubic feet per day, or 125,000 cubic feet per hour. It is a steel main of 9″ internal diameter, with welded joints; but to transmit the same quantity of gas under low pressure, even with the large drop of 2½″ of water, would need a 24″ main, costing over twice as much. The moral is obvious.

Belt Pipe Lines.—Another form of boosting coming into favor is the belt pipe line, which girdles an area at some considerable distance from the center, and is the means of introducing a reinforcing supply into the mains. Provision is thus made for the needs of out-districts, and also, by its "backing up" action, for a reinforcement of the supply to the center. By means of a continuous belt line, pressures throughout the district may be maintained at any predetermined standard, and fluctuations of demand immediately compensated for by an adequate supply. The whole system is immediately drawn upon to make good deficiencies in any portion, and, therefore, as long as the supply as a whole is sufficient, and the governors work properly, no part can be inadeqately supplied. The advantages for future extensions need no emphasis. Further incidental advantages are that as the belt line may be laid through little used, often unpaved thoroughfares, the initial cost of main laying is largely reduced. Laid in such situations, the mains have not to withstand the vibratory strains incidental to central thoroughfares, and there is, consequently, less leakage, and no costly roadway surface to baffle the searcher, and labor charges for opening up the roadway are much less.

In any system of boosting or direct high pressure there are four prime essentials:

(1) Economical compressors.
(2) A sound pipe line.
(3) Efficient governors.
And for private consumers,
(4) Satisfactory registration.

Compressors.—The various types of compressors in this country may be classified under four heads, each doing good work in their sphere. For pressures of 15″ to 30″ of water, fans of the Rateau or Sturtevant type, either motor or turbine driven, have been satisfactorily installed. An example of this is described in connection

with boosting for pressure wave control of public lighting. High speed fans will give efficient service to pressures well over 40" of water. For pressures up to 5 pounds per square inch, compressors of the rotary type are generally used. An installation is shown in Fig. 11, two 20,000 cubic feet per hour compressors, gas engine

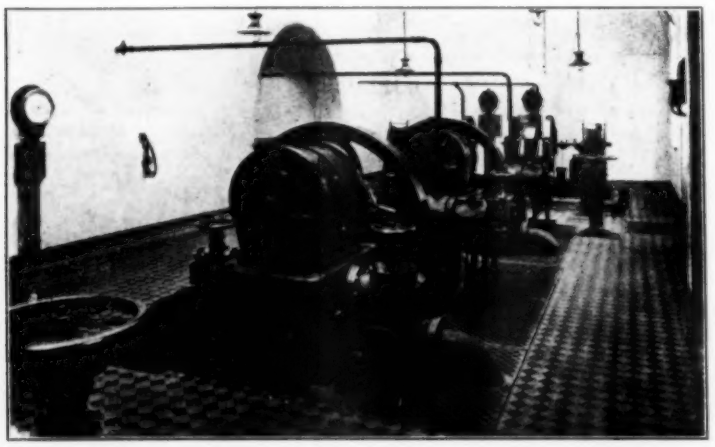


Fig. 11.—Rotary Compressions at Dewsbury Road Gas Works, Leeds.

driven, supplied to the Leeds Corporation by Messrs. J. Keith & Blachman Co., Ltd., of London. For pressures over 5 pounds, reciprocating compressors of the Worthington or Ingersoll-Sergeant types give the most economical results. Fig. 12 shows the steam driven Worthington reciprocating compressors at the Windsor Street Gas Works, Birmingham.

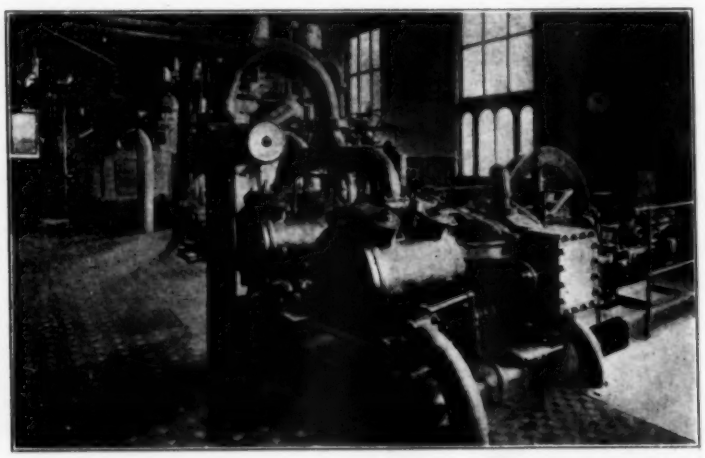


Fig. 12.—Steam-driven Worthington Compressors at the Windsor Street Gas Works, Birmingham.

2. The problem of the sound pipe line has already been dealt with and needs no further reference.

Governors.—The importance of efficient governors needs no emphasizing. Fortunately there are governors on the market capable of dealing most satisfactorily with exceedingly variable quantities of gas, from the smallest to the greatest.

High Pressure Meters.—With regard to registration, the initial difficulties of making the diaphragms and stuffing boxes of dry meters strong enough to withstand heavy pressures, and yet sensitive enough to meet the requirements of our somewhat obsolete "Sales of Gas Act," have been successfully met by the simple expedient of the geared inlet and outlet cocks. By use of these it is impossible for the pressure to come even momentarily upon only one side of the diaphragm. The diaphragm is, therefore, only subject to the difference of pressure between the inlet and outlet which is comparatively small.

Porosity of Cast Iron Meter Cases.—With wet meters, one of chief difficulties has been due to the porosity of cast iron cases under high pressure, but it has been overcome by simply filling up the pores with boiled linseed oil under pressure. Another objection in connection with the wet meter—that of the rapid absorption of water by the compressed gas—has been overcome by making the meters of the spoon compensating type and giving them a large reserve of water in the waste box.

Compensation Devices.—In any high pressure meter the device to give compensation for decreased volume due to compression is the principal feature. In one type it is obtained by wheel gearing in the index train, rather an inflexible arrangement inasmuch as the gearing must be different for different pressures. Another device is shown in Figs. 13 and 14. In this, compensation is ob-

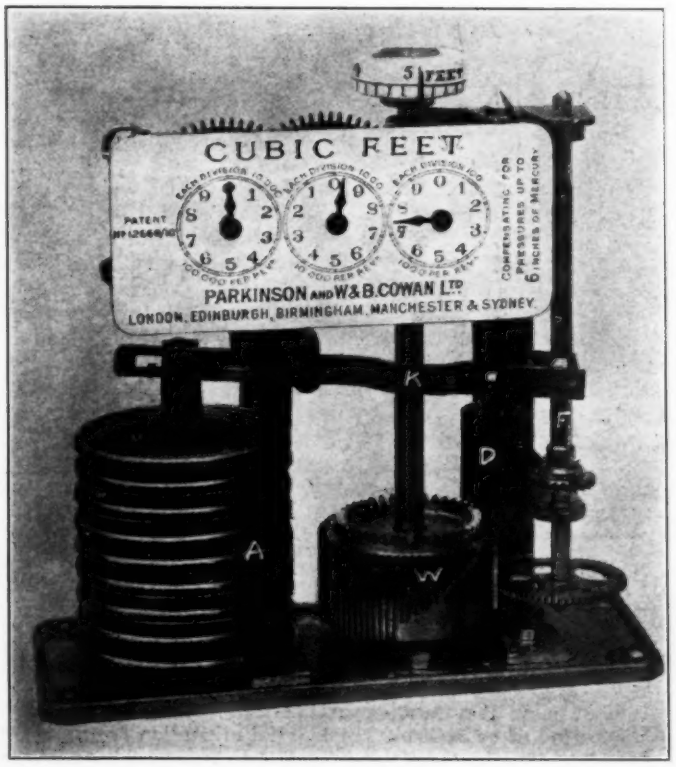


Fig. 13.—Cowan's aneroid compensation device. Open to atmospheric pressure.

tained by the use of an aneroid chamber, *A*, and a compensating wheel, *W*, that has a number of its teeth removed as shown. The aneroid is connected to the countershaft, *F*, by the lever, *K*, to which it communicates its vertical movement, but in an opposite direction. When, therefore, the meter is brought into use the aneroid chamber is subjected to the pressure of the gas and proportionately depressed. The side shaft is correspondingly raised

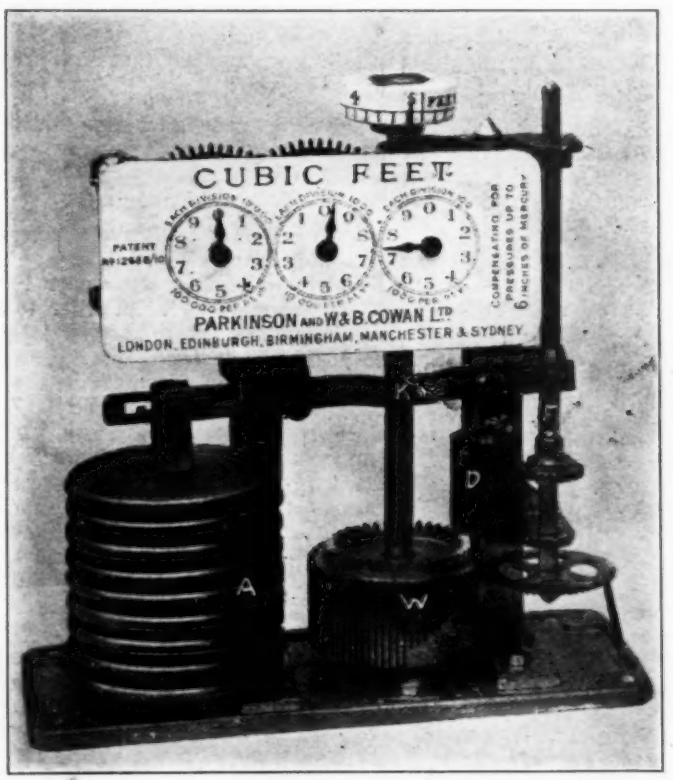


Fig. 14.—Cowan's aneroid compensation device. Aneroid compressed by gas pressure.

and the gear wheel elevated into engagement with the wheel, *W*, at the point in the cutaway that compensates for the loss of volume due to compression. Although it is too soon to give a final verdict, a number of these meters in use in this city for some time have given every satisfaction.

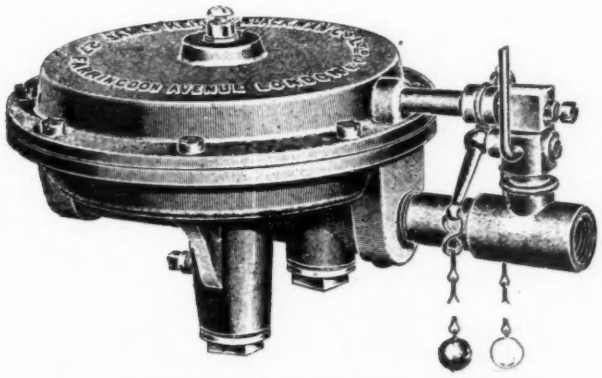


Fig. 15.—Keith Diaphragm Governor.

High Pressure Supply to Consumers Direct.—The application of high pressure gas to consumers direct is in its infancy in this country. Some few undertakings in sparsely occupied districts give high pressure supply to consumers' premises, there to be governed down before passing through the meter. In many places boosting or belt line mains are drawn upon for supplies enroute, which it would be impossible to afford in any other way. A small hamlet, with its handful of cottages, or large isolated houses, have equally welcomed the supply, quite incidental to the purpose for which a particular main was laid. To come from the country side to the town districts a direct high pressure supply for lighting purposes is far from uncommon. Great progress is being made in the provision of high pressure gas lighting for spacious interiors, such as covered-in markets. Very many examples also of high pressure lighting of lecture halls, town halls, corn exchanges and other such premises used for great public meetings are found.

In all industrial centers firms put in plants to compress the low pressure supply from the mains of the local undertaking to a high pressure supply for lighting their establishmets. These conversion plants are very general in engineering workshops, textile factories, printing works, laundries and clothing factories amongst others.

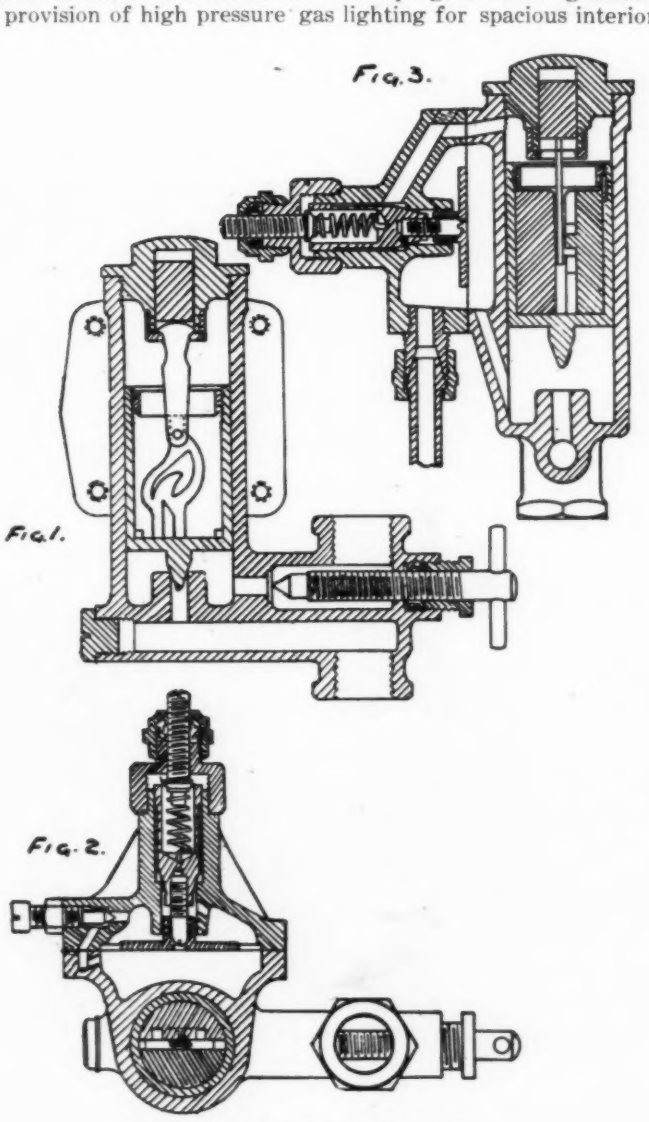


Fig. 16.—Keith's Midnight Device.

C		H				J		D
	.224	.265	.320	.472	.850	1.317	1.380	
	.380	.402	.417	.500	.720	1.120	1.207	
	.770	.740	.605	.502	.505	.582	.602	
	1.212	1.112	.822	.582	.440	.402	.395	
	1.405	⊙ 1.300	.907	.620	.462	.392	.382	
	1.085	1.052	.762	.542	.510	.537	.562	
	.577	.603	.526	.520	.717	1.007	1.102	
	.315	.358	.386	.522	.895	1.340	1.475	
	.225	.267	.320	.447	.910	1.502	⊙ 1.675	
	.252	.292	.317	.415	.775	1.255	1.352	
	.345	.392	.367	.397	.510	.625	.632	
A		E				F		B

Fig. 17.—Table of Photometrical Tests of Public Lighting, taken at Ground Level in one of the Leeds Thoroughfares

High Pressure Gas for Metallurgical Work.—Another great field for the direct supply of high pressure gas is that of metallurgical operations of various kinds. For melting metals, for annealing and tempering processes, for tool making, for brazing and bending, and many other simple operations, high pressure gas provides a cheap and reliable source of heat. For these operations high pressure gas has four great advantages over every other method of heating. It is absolutely under control; even temperatures may be maintained; any temperature or set of conditions may be reproduced absolutely, thus leading to uniformity of results; and the heat may be applied in almost every conceivable circumstance and condition.

High Pressure Gas for Public Lighting.—Another important purpose for which high pressure gas is somewhat slowly, but none the less surely impressing its merits is the public lighting of our thoroughfares. The lamps are generally supported on columns on the footpaths, or in the centers of very wide streets. In addition, centrally suspended lamps are also being rather cautiously installed.

Control.—Whether supported on columns or suspended from cables lamps may be centrally controlled, as many as twenty to twenty-five being connected to one switch. The method of control adopted by the writer in one installation, and which has so far given every satisfaction, is the diaphragm governor shown in Fig. 15. The pressure wave midnight device shown in Fig. 16 is also successfully used in this district. By it one or more burners of multiple burner lamps may be turned out at midnight by a pres-

sure wave put on by the compressors. The two together give a degree of control not hitherto considered possible. Economical working is secured and manual labor is very largely eliminated. The various operations of lighting, reducing and extinguishing are greatly simplified, with distinct advantage to the public lighting and satisfaction to the authorities.

Lighting Effect.—The brilliancy and evenness of the lighting given by high pressure lamps may be appreciated by a perusal of chart, Fig. 17, which shows some photometrical tests taken at ground level in one of our main city thoroughfares. For the purpose of the test the ground surface was divided into 11-foot squares and the position of the lamps is shown by the circles. The average candle-foot illumination on each square is given, and is obtained by dividing the sum of the readings at the corners by 4. It will be noticed that the maximum difference anywhere obtained is not more than 6 to 1, whilst the lighting down the center of the roadway is exceedingly even. In the chart the lines *AC* and *BD* represent the line of shop frontages, and *EH* and *FJ* the curb. The average illumination over the whole section tested (of which the chart only shows a part) worked out to 0.592 candle-feet in each square.

Outside Shop Lighting.—High pressure gas has also come to occupy a fairly large place in the semi-public lighting of our large towns, particularly outside shop and parade lighting. In many places high pressure gas lamps are rapidly obtaining a dominating position. Until the temporary, but very severe lighting restrictions were promulgated by our military authorities, hundreds of such lamps were in central thoroughfares and shopping centers, emitting their brilliant, yet soft and pure light on shop window goods or footpath, to the satisfaction of both tradesman and pedestrian. In many places they were lit by an employee of the gas department, in others by the consumer, and in yet others by the mere process of starting the compressors. It is a most interesting sight to see several hundred large unit lamps, ranged along many hundreds of yards of streets, lighting by means of one operation at the works or compressor house.

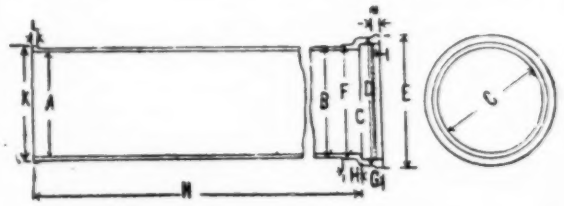
Where high pressure lamps are operated by hand, they are fitted in the large units with flashing by-pass cocks, of which the best known is that shown in Fig. 18, manufactured by Messrs. James Keith & Blackman Co., Ltd. of London.

Where central control is adopted, the automatic distance control of Messrs. J. Keith & Blackman, or that of the Welsbach Company in connection with Pharos lamps are generally used.

High Pressure Services.—When high pressure gas services are laid to consumer's premises, it is usual to take two precautionary measures. In addition to the cocks inside the building, a general control cock is fixed in the footpath outside the premises. In event of accident, or the necessity of having to shut off a portion of the main, or work on the main that would affect the by-passes of interior lights, work which frequently has to be done on Sunday when business premises are closed, it is thus possible to avoid all risk by shutting off the control cock. It is then turned on again only when the premises can be entered and the authorities satisfied that all risks have been avoided. Where the high pressure supply is governed down on the consumer's premises for low pressure consumption it is also usual to affix a vent, carried to the exterior of the premises. In the event of the governor not working freely, a dangerous building up of pressure upon the meter inlet is thus avoided.

APPENDIX A.—*Measurements and Weights of Cast Iron Pipes.*

Measurements in inches.											Ft.	Average weight.			
A	B	C	D	E	F	G	H	I	K	L	M	N	Tns.	Cts.	Qrs.	Lbs.
3	3 3/4	4 1/2	5 5/8	6 1/16	4	3 3/4	2 1/2	3/4	3 15/16	3/4	1	9	0	1	0	14
4	4 7/8	5 5/8	6 7/8	7 3/4	5 3/16	4	2 1/2	3/4	5 1/16	3/4	1 1/8	12	0	2	0	12
6	6 15/16	7 11/16	9 1/4	10 1/4	7 1/4	4 1/4	2 3/4	3/4	7 1/8	7/8	1 1/4	12	0	3	1	16
8	8 15/16	9 11/16	11 1/4	12 1/4	9 3/8	4 1/2	3	3/4	9 3/16	7/8	1 1/4	12	0	5	1	23
10	11 1/4	12 1/8	13 11/16	14 11/16	11 11/16	4 1/2	3 1/4	3/4	11 1/2	7/8	1 1/4	12	0	7	2	10
12	13 1/4	14 1/8	16	17	13 3/4	4 1/2	4 1/4	1	13 5/8	7/8	1 3/8	12	0	9	1	18
14	15 1/2	16 3/8	18 5/8	19 5/8	16	4 1/2	4 1/4	1	15 7/8	1	1 3/8	12	0	10	2	0
16	17 1/2	18 3/8	20 7/8	21 7/8	18	4 1/2	4 1/4	1	18	1	1 3/8	12	0	13	2	0
18	19 1/2	20 3/8	22 7/8	23 7/8	20 1/8	4 1/2	4 1/4	1	20	1 1/8	1 1/2	12	0	16	0	0
20	21 3/4	22 3/4	25 1/2	26 1/2	22 5/8	4 1/2	4 1/4	1	24 1/4	1 1/8	1 1/2	12	0	18	2	8
22	23 3/4	23 3/4	26 1/2	27 1/2	24 5/8	4 1/2	4 1/4	1	24 1/4	1 1/8	1 1/2	12	1	0	2	14
24	25 3/4	26 3/4	29 3/4	30 3/4	26 5/8	5	4 1/4	1	26 1/4	1 1/4	1 1/2	12	1	4	0	0
30	32	33	36 1/8	37 5/8	32 7/8	5	5 1/4	1	32 1/2	1 1/4	1 3/4	12	1	16	0	0
36	38	39	42 1/4	43 3/4	38 7/8	5	5 1/2	1 1/4	38 1/2	1 1/4	1 3/4	12	2	3	2	18
42	44 1/4	45 1/4	48 1/2	50	45 1/8	5	5 1/2	1 1/2	44 3/4	1 1/4	1 3/4	12	2	16	0	0
48	50 1/4	51 1/4	54 1/2	56	51 1/8	5	6	1 1/2	50 3/4	1 1/4	1 3/4	12	3	4	0	0
54	56 1/2	57 1/2	60 3/4	62 1/4	57 3/8	5	6	1 1/2	57	1 1/4	1 3/4	12	3	19	2	0



APPENDIX B.—*Standard Dimensions of Steel Mains.*

Internal diameter of pipe in inches..	3	4	6	8	10	12	14	16	18	20	24	27	30
Thickness of pipe I.W.G. *standard*..	12	11	10	8	3/16	3/16	3/16	3/16	3/16	1/4	5/16	3/8	1/2
Weight per foot run in pounds.....	3.49	5.12	8.37	13.82	20.40	24.4	28.41	32.42	36.42	54.07	81.15	109.65	162.89
Thickness of pipe I.W.G. *medium*...	11	10	9	7	5	5	5	5	5	9/32	11/32	7/16	9/16
Weight per foot run in pounds.....	3.88	5.63	9.39	15.18	23.01	27.54	32.07	36.6	41.13	60.74	89.15	127.63	182.88
Thickness of pipe I.W.G. *heavy*.....	10	9	8	3/16	4	4	4	4	4	5/16	3/8	1/2	5/8
Weight per foot run in pounds.....	4.27	6.32	10.41	16.15	25.14	30.00	35.05	40.0	44.96	67.39	97.13	145.53	202.78

APPENDIX C.—*Dimensions of Wrought Iron Tubes.*

Internal diameter in inches.....	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6
External diameter in inches.....	1 1/16	1 11/32	1 11/16	1 29/32	2 3/8	3	3 1/2	4 1/2	5 1/2	6 1/2
Thickness of tube, B. W. G	9	8	7	6	5	5	5	5	5	5
Decimal equivalent in inches.....	0.148	0.165	0.180	0.203	0.220	0.220	0.220	0.220	0.220	0.220
Approximate weight per foot run, in lbs.....	1.422	2.038	2.863	3.539	4.931	6.364	7.535	9.843	12.325	14.725
No. of threads per inch.....	14	11	11	11	11	11	11	11	11	11
Gauge diameter at top of thread.....	1.041	1.309	1.650	1.882	2.347	2.960	3.460	4.450	5.450	6.450
Depth of thread	0.0455	0.0580	0.0580	0.0580	0.0580	0.0580	0.0580	0.0580	0.0580	0.0580
Length of screw on tube, in inches.....	3/4	7/8	7/8	1	1 1/8	1 1/4	1 3/8	1 5/8	1 3/4	2

For services and fittings only wrought iron pipe of steam quality is used, and it is customary before fittings are connected up to the main to insist on their successfully withstanding a test up to three or four times their working pressure.

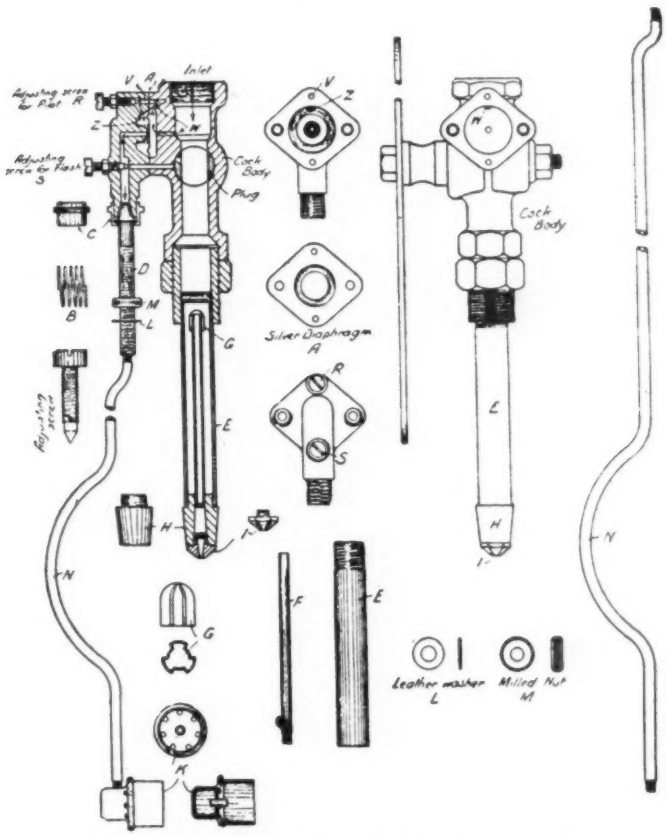


Fig. 18.—Details of Keith's flashing by-pass cock.

Recapitulation.—To recapitulate, the outstanding features of present day gas distribution practice in England, as far as covered by the present paper, are:

I. The passing of the storage and distribution station as hitherto known.
II. The coming of the booster.
III. The challenge of steel in respect of main pipes.
IV. Great improvements in methods of jointing.
V. Advance in standards of supply pressures.
VI. The raising of the standard of public lighting.
VII. The enormous development in high pressure distribution for lighting and industrial purposes.

Boiler Explosions.

"Every year there are in the United States between 1,300 and 1,400 serious boiler accidents, which kill between 400 and 500 persons, injure 700 to 800 more, and destroy more than a half million dollars' worth of property," said Mr. William H. Boem in a lecture before the Cornell University student branch of the American Society of Mechanical Engineers.

Boiler explosions may be attributed to improper construction and installation, or careless operation. Improper construction may mean unsuitable or inferior material; poor workmanship, abuse of material, as when unmatched rivet holes are drift-pinned to place or uncylindrical shells are sledged to form; or using a lap-joint for the side seams, instead of the safer butt-joint.

Careless operation may consist in allowing the steam gauge to get out of order; allowing the water-gauge connections to become clogged, and indicate ample water when there is little in the boiler; allowing the safety valve to become stuck and fail to blow at the pressure for which it was set; allowing grease to enter or scale to accumulate in the boiler; allowing large quantities of cold water to be impinged against hot plates; driving the water from heated surfaces by forced firing; opening a large valve too suddenly; allowing two boilers to be cut in on the same steam main when their pressures are unequal; and neglecting minor repairs until they endanger the whole structure.

"Hazards of Gas Works."

[Paper presented before Public Utilities Round Table Sectional Meeting of the National Safety Council by JAMES B. DOUGLAS.]

With but few exceptions the hazards met in the operation of gas works are those met in other industrial plants. Many persons think that "gas accidents" predominate in the casualty experience incident to the manufacture of illuminating gas; but such is not the case. The result of a survey of some 6,000 employee accident cases, reported by 119 gas companies located in 36 States, which I have just completed for the American Gas Institute, showed that the accidents peculiar to the industry were:

	Per Cent.
Leakage of gas, outside (including 3 fatalities)	1.03
" " " inside	1.62
Explosions (including 3 fatalities)	3.01

Amounting in all to but 5.66% of the cases received. The remaining classifications were:

	Per Cent.
Machinery in operation (including 1 fatality)	2.63
Elevators (2 fatalities)	2.19
Falling in or through openings (1 fatality)	4.23
Hot material (1 fatality)	4.88
Objects, hanging or swinging	.75
Objects, protruding	4.36
Objects, falling (1 fatality)	11.29
Flying particles	7.87
Vehicles (3 fatalities)	8.69
Nails, wires, etc	6.53
Handling of material	9.73
Slipping or tripping	8.93
Hand tools used by injured	12.80
Hand tools used by fellow employee	2.19
Animal bites	1.75
Miscellaneous (1 fatality)	5.52

From this it will be observed that in combating the accident frequency, we are confronted by the same problems met by other employers in the industrial world.

Although time forbids going but slightly into the subject assigned me, I shall endeavor to give you an idea of some of the most likely causes of accidents around a gas works.

In the generator house some of the accidents are due to:

Employees not standing at a safe distance from the mouth of the generator when opening the lid, to avoid being burned by the burst of flame that immediately follows its removal.

Pieces of fuel falling from overhead conveyor and its supporting structure. To be prevented by trimming and the removal of any loose pieces lodged overhead.

Tripping over obstructions or tools left on the floor, and catching feet in holes in the floor. Of course, obstructions should be removed as far as practicable, and tools should be stored out of the way, preferably in racks, and the holes should be closed.

Falling of tools and similar articles from floors. This type of accident is prevented by copings or toe pieces around the edge and openings in the floor.

Hot material getting into workmen's shoes while they are engaged in clinkering; striking knuckles against the floor or against standing objects while engaged in this operation; misblows in sledging; scalds due to carelessness in standing too close when wetting down clinkers. Accidents in the first class mentioned are prevented by lacing shoes snugly or by wearing Congress shoes. To prevent accidents in the other classes it is only necessary to be careful first.

Collisions between and with fuel buggies and barrows. Where conditions permit, buggies and barrows should not be returned over the course used when loaded. In other words, a one-way passage is the safest.

Loose floor plates, uncovered seal pots, and relining bricks insecurely piled are also hazards to be looked for. All floor plates should be securely fastened in place. Seal pots should be covered or surrounded by guards, as serious accidents have been caused by employees stepping into them and sustaining burns that have become infected. It is important to see that bricks are so piled that they will not become overbalanced. (I note striking illustrations of the safe and the unsafe ways of piling bricks in Bulletin No. 90 just issued by the National Safety Council.) When men are at work relining generators, it is advisable to place a screen over the opening in the tops of the generators to protect those inside being injured by falling bricks and fuel.

(*Continued on page 330.*)

THE AMERICAN GAS LIGHT JOURNAL

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CHARLES H. WADELTON, Secretary and Manager.

SANFORD K. CAMPBELL, Editor.

NEW YORK, MONDAY, NOVEMBER 22, 1915.

Confidence in Advertising.

It is possible to make the public believe most anything if you repeat it often enough. But your effort is worse than vain if the buyers experience does not confirm the advertised features. It is not possible to measure your success in advertising by the volume of sales obtained if you have resorted to anything not altogether frank. It was, of course, originally from a selfish motive that the N. C. G. A. took up a campaign against misleading advertisements derogatory of gas, but its effort now is to correct all untrue statements, whether designed to "knock" or "boost." That this is something that every great industry should supervise there can be no doubt. The public has outgrown the wish to be humbugged, and our law makers are coming to look upon dishonest advertising practices as unfair competition. The Associated Advertising Clubs of the World are doing good work in this direction, and their representatives will urge a National fair play movement before the Federal Trade Commission, which will take up the matter at a hearing this month in Washington.

Utilities Bureau Conference in Philadelphia.

The three days' Conference on Valuation held in Philadelphia under the auspices of the Utilities Bureau, which was an outcome of the Conference of Mayors, held last year, was attended by quite a few well known engineers and Commission representatives. The first session was held on Nov. 10, the speakers then including John M. Eshleman, Lieutenant Governor of California; H. Findlay French, a Baltimore attorney, and Morris L. Cooke, director of public works, Philadelphia. The speakers on Thursday were George W. Anderson, of Boston, and John G. Morse, appraiser for the Associated Factory Fire Insurance Companies, Boston, and Charles L. Pillsbury, chief engineer of the valuation bureau of the District of Columbia Utility Commission.

Mr. Pillsbury spoke of the useless expense of continually taking detailed inventories. He urged adjudication for public purposes "in the field," rather than in a court of law or at a commission hearing, and said this would do away with delay and complication, asserting that such non-essentials as the number of bricks in a building or the pounds of copper in an electric system have burdened both sides to public inventories with heavy costs of litigation.

"Valuations, so far, have been mostly 'flashes in the pan,' most expensive procedures for specific purposes—and then discarded and the process repeated when a new need arose. If inventories are made on the cost of reproduction basis, sufficiently detailed, with not too much transposition and summarizing of items, with all physical property listed and segregated, and with normal prices applied, inventories can be maintained to advantage, and such maintenance should be strongly advocated. The public will pay the cost in any case," he added, "as the inventory maintenance will become an operating cost. A permanent valuation staff should be organized within the company for the purpose, utilizing all departments needed, but all under outside direction and supervision."

Dr. Delos F. Wilcox, consulting engineer and public utility expert of New York, one of the speakers on Friday, said the present acute danger is not that some elements of value will be overlooked by the tax appraiser, but that he will see double. "Under the stress of public regulation," he said, "the protagonists of vested rights have discovered many new elements of value in public utility properties. In this manner danger, if not necessity, has been the mother of invention. At the present time we need to fear, not that some elements of value will be overlooked, but that the appraiser's eye, after being shown the multifarious riches of the public utility world from the top of a high mountain, will see double. In considering franchises, we must not forget that the first and principal function of a franchise is to give life and value to the physical property. A franchise is needed for this purpose, because without it the physical property itself is a trespasser."

Mr. Bemis, in his remarks, said that the oldest of the State commissions—the Massachusetts Gas and Electric Light Commission—has always sought to base a fair value for rates on capitalization and only that part of the cost that has been borne by direct contributions of the stockholders and bondholders. "The propriety of this further step," he said, "successfully maintained in the recent Haverhill gas case, is not now under discussion, but is mentioned only as it is based on the acceptance of original cost as all important."

Gas Meeters, New York Section Flatbush Nite.

A real old-fashioned "Meeters" good fellowship gathering was held on Thursday evening, November 18th, at Guffanti's, Coney Island.

This was only part of the program, however, as elaborate arrangements had been made by Hans J. Gerlich, chairman of the entertainment committee, for the inspection of the works of the Flatbush Gas Company. This company, by the way, is a subsidiary of the Brooklyn Union Gas Company, and supplies both gas and electricity to the "swells" of Brooklyn.

The welcome sign for the Gas Meeters, at the entrance to the works, was full of meaning, because Superintendent Edw. J. Devlin and his assistants were very much in evidence. Of especial interest were the two 300-horse power gas engines used for maintaining pressure on the high pressure lines.

Following the inspection of the plant, the members boarded autos and were driven to Coney Island, where an Italian dinner was served to 140 members and guests.

Following the dinner, Chairman C. E. Chapple called upon Dr. Chas. T. Baylis, who lectured on "Through Desolated Belgium, With a Camera." The slides, numbering 150, gave evidence of many unusual opportunities for observation, and also a broad view point. The attendance was very gratifying to Secretary A. M. Berg and to the dinner committee which consisted of Hans J. Gerlich, R. W. Bayley, C. L. Wellander, J. M. Brock and J. S. McArthur. Among those present were: W. H. Pettes, T. M. Ambler, H. J. McGowan, S. W. Gatehouse, F. R. Wogan, Emil Korthaus, C. I. Hodgson, J. E. Bullard, H. D. Gillingham, G. M. Karshner, "Pop" Mason, J. P. Conroy, S. Tully Willson, Jesse Stetzer, Geo. Humphrey, I. W. Peffly, B. K. Johnson and J. R. Vroom.

Brooklyn Domestic Science Class in Pratt Institute Curriculum.

The Pratt Institute in Brooklyn has arranged to make the Domestic Science Course of the Brooklyn Union Gas Company part of its curriculum. Commercial Manager, T. M. Ambler, announces that the total attendance at the Gas Company Courses in the past 9 months has been over 38,000, making this the biggest Gas Educational Course in the country.

ELEVENTH ANNUAL CONVENTION AND GAS APPLIANCE EXHIBIT, NATIONAL COMMERCIAL GAS ASSOCIATION, WASHINGTON, D. C., NOV. 29 TO DEC. 4, 1915.

Members of the National Commercial Gas Association are invited and urged to attend the forthcoming Eleventh Annual Convention and Exhibition of Gas Appliances, at the New Willard Hotel, Washington, D. C., November 29th to December 4th. The meeting will be a fitting end to one of the most successful years in the Association's history. A large attendance is assured, and the meeting and exhibit should be helpful to every member. All of the sessions will be held in the New Willard Hotel, in a large hall immediately adjoining the appliance exhibits.

In order to allow the delegates full opportunity for study and comparison of the various appliances on display, as well as to give the manufacturers' representatives opportunity of attending the sessions, there will be no morning sessions, except the opening session, on Tuesday morning, and a special session on Thursday morning for the Industrial Fuel and the Differential Rates Committee. Members who are interested in these topics are invited to attend these committee sessions.

The Registration Bureau will be located in the hall immediately adjoining the Convention and Exhibition Halls, and will be open Saturday morning, November 27th, and every day during the convention. All members, whether registered in advance or not, are requested to register immediately upon arrival, and those who expect to attend are requested to notify the Association, at its offices in New York city, as promptly as possible.

Hotels and Headquarters.—Hotel reservations must be made by members direct with the hotels. The New Willard Hotel will be the headquarters of the Association. The following hotel rates will be in effect:

The New Willard—Single rooms, without bath, $2.50 and $3 per day; with bath, $3.50 and $4.

The Raleigh—Room, without bath (1 person), $2.00 and $2.50 per day; with bath, $3.00 per day upward.

The New Ebbitt—American Plan—Single room, without bath, $3.50 per day; with bath, $4.50 per day. European Plan—Single room, without bath, $1 50 per day; with bath, $2.50 per day.

Entertainment Features. The Entertainment Committee has prepared a program that will not interfere with the business of the Convention. There will be many interesting and entertaining functions during Convention Week, but the Association is on record as discouraging any tendency to consider its annual gatherings as anything but business meetings, with, of course, the proper relaxation and diversion in the right place.

Thursday evening will be "Gas Meeter's Night." Grand Commissioner F. R. Hutchinson has appointed a committee of fifteen "Meeters" to plan a good time for that night. As most of the time at Washington will be given to serious business thoughts there will be no business at the dinner, and no set speeches. It will be purely a good-fellowship affair.

The committee's first consideration, of course, will be given to the satisfaction of the inner man, and the entertainment will include the pick of the vaudeville talent in Washington The committee is made up of officers and past officers of the organization, to whom the arrangement of "Meeters" dinners is an old story, and as practically all of them served on the committee in charge of the big "Meeters" dinner at Philadelphia two years ago, it is fair to assume that the Washington dinner will even be a greater success than the Philadelphia affair.

PAPER PROGRAM (Subject to Revision).

Tuesday Morning, 10 O'clock.

Address of welcome and response.
Report of Board of Directors.
Report of Treasurer.
Report of Finance Committee.
Report of Committee on Amendments to Constitution.
Report of Committee on Public Policy.
Report of Committee on Membership.
Report of Committee on Company or Local Sections.
Report of Manufacturers' Section.
Address of the President.
Report of Nominating Committee.
Report of Time and Place Committee.

Tuesday Afternoon, 2 O'clock.

Paper: "Selling Gas Service," by George Williams, of H. L. Doherty & Co., New York, N. Y.
Paper: "The Principles of Merchandising as Applied to Gas Service," by Joseph H. Appel, Director of Publicity of the John Wanamaker Stores.
Report of Publicity Committee.
Report of Advisory Committee to the President.
Report of Committee on Standardization of Gas Appliance Specifications.
Report of Advisory Committee on Exhibitions.

Wednesday Morning.

No open session. Open for members to visit exhibit.
Special session of Differential Rates Committee.

Wednesday Afternoon, 2 O'clock.

Report of Committee on Reciprocal Relations with other Associations.
Report of Illumination Committee.
Paper: "Some Notes on the Maintenance of Incandescent Gas Lighting," by L. B. Eichengreen, The United Gas Improvement Co., Philadelphia, Pa. (I. E. S.)
Paper: "Fundamental Principles of Good Lighting," by Dr. P. G. Nutting, Eastman Kodak Co., Rochester, N. Y. (I. E. S.)

Thursday Morning.

No regular session. Open for members to visit exhibit.
Special session of Committee on Development of Industrial Fuel.

Thursday Afternoon, 2 O'clock.

Inspirational address, by Hon. James M. Beck.
Report of Board of Educational Control.
Report of Committee on Salesman's Handbook.
Report of Accounting Committee.
Report of International Committee on Commercial Advancement.
Report of Committee on Domestic Fuel Appliances.

Friday Morning.

No regular session. Open for members to visit exhibit.

Friday Afternoon, 2 O'clock.

Report of Committee on Development of Industrial Fuel.
Report of Committee on Central Development Bureau.
Report of Commitee on Heating, Refrigerating and Ventilation.
Repord and Recommendations of Committee on Differential Rates.

Transportation Arrangements.—The Transportation Committee has arranged special train and car service, and as only a limited number of cars will be carried, it is essential that the railroads be notified well in advance. It is important, therefore, that those desiring accommodations notify the member of the committee having charge of the particular train or car on which reservation is desired.

"St. Louis Special"—From St. Louis, via Vandalia R. R. and Penna. lines.

Sunday, November 28.

Lv. St. Louis, Vandalia R. R., Train 26 (Central Time) . . 12:08 P.M.
Lv. Terre Haute . . . . . 4:50 P.M.
Lv. Indianapolis, Penna. Lines . . . . . 6:45 P.M.

Monday, November 29.

Lv. Columbus, O . . . . . 12:35 A.M.
Ar. Pittsburgh . . . . . 5:42 A.M.

To be attached to P. R. R. Special Train at Pittsburgh.

For reservations write to C. C. Curtice, District Passenger Agent, Vandalia Railroad, 10th and Olive streets, St. Louis.

"Boston Special"—From Boston, via N. Y. N. H. & H. (South Station or Back Bay) and Fall River Line.

Sunday, November 28.

Lv. Boston (South Station) . . . . . 6:00 P.M.
Ar. New York . . . . . 7:00 A.M.

For reservations write to R. C. Ware, Boston Consolidated Gas Co., 24 West street, Boston.

"Chicago Special"—From Chicago, via Pennsylvania Lines.

Sunday, November 28.

Lv. Chicago, Train 2 (Central Time) . . . . . 5:30 P.M.

Monday, November 29.

Ar. Pittsburgh . . . . . 5:30 A.M.

To be attached to P. R. R. Special Train at Pittsburgh.

For reservations write to O. T. Knight, Peoples Gas Light and Coke Co., Chicago.

"Detroit and Toledo Special."—From Detroit and Toledo, via Michigan Central and Pennsylvania Lines.

Sunday, November 28.

Lv. Detroit, Mich. Centtral (Central Time) . . . . . 8:20 P.M.
Lv. Toledo, Pennsylvania Lines.. . . . . 10:35 P.M.

Monday, November 29.

Ar. Pittsburgh . . . . . 5:50 A.M

To be attached to P. R. R. Special Train at Pittsburgh.

For reservations write to R. C. Fowler, Detroit City Gas Co., Detroit.

(*Continued from page 327.*)

"Hazards of Gas Works."

Foot injuries due to the absence of toe guards at the floor levels of elevator shafts, are experienced from time to time. Those are prevented by toe-plates installed at the floor levels. If the plate is set at the proper angle, the employee will involuntarily withdraw his foot to the platform as soon as it is touched by the toe guard; if not, the guard will push the foot back and serious injury will be avoided.

In the retort house a number of hazards are found, in addition to some of those just mentioned. They are:

Unguarded coke holes in floors in front of retorts, resulting in employees stepping therein while clearing up coke, etc. Unless care is exercised to see that employees working in the cellar, near these holes, are warned before the hot coke is dropped, they are liable to be burned.

Steam scalds, when employees stand too close to the pile when wetting down hot coke.

Hot tar, which causes burns and eye injuries when employes fail to wear goggles and gloves while bulling or cleaning the pipes the conduct the gas from the retorts to the hydraulic main.

Employees are also liable to be run into by charging and discharging machines while closing doors. It is advisable to place a signaling device, such as a horn or gong, on these machines to give warning when they are about to move. It is important also to see that the gears of these machines are guarded. The wheels also should be guarded to prevent foot injuries.

In the boiler and engine rooms care should be exercised to see that the passageways are kept clear, and that fire tools, barrows and other things are kept in their proper places. Fuel and ashes should be kept within restricted limits.

At times, nails and pegs to hold tools and clothing are found extending from walls at face level. Such projections are dangerous hazards when not in use, and they should be removed. Clothing should be hung in lockers, and fire tools should be kept in racks.

It is also dangerous to leave weights on dampers and regulator levers, on account of the likelihood of their falling and causing injury.

Loose bricks are frequently found on the tops of boiler settings, and they should be promptly removed or rebedded.

Where a safety valve blows off acrosss the top of a boiler, the outlet should be so extended that the steam will be discharged vertically, above body level if practicable.

The bursting of water gauge glasses is comparatively frequent, and care should be taken to see that proper guards are installed to protect the eyes of employees engaged in adjusting the gauges.

Where boilers are connected in battery, separate blow-offs should be run in order to avoid the possibility of steam backing up into boilers that are being cleaned or repaired.

Moving machinery, shafting and belting should be guarded, either by railings or expanded metal screens. (It is important to become familiar with the safety standards prescribed by the State.)

When cleaning purifier boxes in houses, employees are liable to be affected by gas in the absence of proper ventilation. Care should be exercised to see that employees do not work too close together when forking oxide. Minor injuries, such as puncture wounds due to fork tines, because of the presence of the oxide are likely to result in blood poisoning. The soles of the shoes worn by employees engaged in this work should not have holes in them, because of the liklihood of infection following a mere scratch on the foot.

The passageways between purifier boxes usually being narrow, it is especially important to see that tools are not allowed to remain thereon.

The principal hazards in the coal shed are failing objects and insecure walkways and platforms, and unguarded trestles from which employees have fallen and sustained serious injuries. Every effort should be made to keep loose pieces of coal and tools off trestles and the ledges at the top of the bins, in order to avoid head injuries. Care should be exercised to see that walkways and platforms are of the proper width, and that railings are provided where practicable

Naked flames should not be permitted where coal dust is present, as they might ignite the dust.

In the yard, care should be exercised to see that barrows and carts are stored in their proper places, in order that they will not be run into by thoughtless employees. If necessary to have a guy line at body level, a warning sign should be hung thereon.

Valve stems and boxes in passageways should be level with grade in order to avoid the tripping hazard.

Boards and discarded material should be piled at points designated therefor. It is safest to bend over or remove old nails from loose boards.

Small pipe lines running across yards should be boxed in, or placed below the ground level, preferably the latter.

Care should be exercised to avoid placing guys and marking stakes where liable to cause employees to trip, and as soon as the guys and stakes have served their purpose they should be removed.

Gates should be made fast so that they will not swing in the wind and strike employees.

All persons should be kept off the ash dumps as far as practicable, owing to the likelihood of their stepping into concealed fires.

Exhausts should be made to discarge vertically and above head level.

Pumps or steam pits should be so located that the steam will not cloud passageways.

Railings should be placed along stairways and around platforms and walkways of holders; also on the galleries in front of syphon valves.

Loose material should be removed from tops of holders, stairways and platforms, from which it is likely to be blown and do harm.

It is advisable to drill holes in any depressions in the platforms and walkways in which water gathers, in order to let off the water and avoid the formation of ice, which might result in slipping accidents.

Of course, systematic safety work is the most effective step towards results in this field. At our "Station A" works in Philadelphia, the decrease in working days lost due to accidents, during the first nine months of the present year was 17%, compared with the same period of last year, when less men were employed.

Differences in condition and the size of gas companies make it impossible to outline a safety organization that will meet every demand, but the following simple plan should fulfil the requirements of the average gas company:

The safety organization to consist of a chairman, who should be the manager, superintendent or his assistant, a safety inspector, and three other employees, appointed from the Manufacturing, Distribution and Commercial Departments, by the Chairman of the Committee. This committee should meet at least once a month, when the work of the month should be gone over and discussed. Special meetings should be called in the event of a serious accident or of one of peculiar interest. Safety items in the trade journals should also be reviewed, and the committee should compile and issue such information and statistics as are applicable to the company and existing conditions, should pass upon articles, pictures, etc., for bulletin boards, should investigate and act upon recommendations submitted, and should devise ways and means to keep alive the interest of the employee to the importance of exercising care to prevent accidents. Interest in the subject is of course intensified by safety talks with lantern slides and motion pictures. First aid competitions, etc., are also very beneficial.

The Safety inspector should be chosen from among the employees of the company, and should be one who can devote a good part of his time to looking after safety details. He should make thorough inspections of the plant periodically, noting all accident hazards and hazardous working conditions. It should be his duty to pass upon the installation and maintenance of safeguards.

The men appointed from the several departments should be chosen from the rank and file of the employees. Care should be taken in making these appointments, as the men chosen should be proficient in their own work and should command the respect of their fellow employees. The duties should be to be always on the alert to note and report accident and fire hazards, and to make weekly inspections of company work and property. All recommendations should be referred to the safety inspector, who should investigate the conditions reported and submit the result to the committee. These men should meet with the safety inspector at such times as may be desired by him, when all new cases should be reviewed and new prevention work and ideas discussed. The personnel of the employee members of the Committee should be changed from time to time, in order that all suitable employees may eventually receive training in safety and broaden their knowledge of the work.

I trust that in the foregoing, which is necessarily incomplete, I have given information that will prove useful to those who are endeavoring to eliminate accident hazards in gas works.

ORDERS AND COMPLAINTS.

[Paper by W. J. CLARK, to the International Gas Congress.]

At the outset of this paper we will assume it to be conceeded that, given a good quality of gas, an efficient distribution system and a reasonable charge per 1,000 cubic feet (each of which is of manifest importance), there still remains one factor upon which practically everything else is founded. This factor is what we call "good service." The question, therefore, as far as this paper is concerned, resolves itself into this; what constitutes good service so far as the Order and Complaint Department is concerned?

As its name would imply, the Order and Complaint Department is that portion of the gas company's local office organization which comes most frequently and continuously into direct contact with the public, either in person or through the medium of the mail or telephone. The public is, at all times and by every company, invited to call at the office of the company and become acquainted. A consumer, believing the invitation to be sincere and having a complaint to lodge, decides to call on his way to business. As he opens the door and enters the office, it goes without saying that his first impression of the company will be favorable or otherwise, according to the conditions that meet his gaze.

If he enters a dirty and poorly-lighted office, has to search for the proper clerk, or to wait before he receives attention—if he sees the desks untidy, ink-smeared books lying around open, if he perceives a general air of confusion or indifference, he must derive the impression that the company is slipshod in its methods. The office should be brightly lighted and attractive, its arrangement neat, the employees all tidy and interested in their work. The customer should be waited upon immediately, and cordially greeted. The man at the desk should be well dressed (never without his coat on), and of pleasing appearance generally. He should be free from the odor of liquor and of tobacco, his fingers free from cigarette stains. In manner, he should be suave and his voice agreeable in tone; he should also be intelligent, should use good English, and be a sufficiently fluent talker to avoid the hesitation that conveys an impression of lack of knowledge, or uncertainty.

Generally speaking, in every line of business, there are two kinds of complaint—the reasonable and the unreasonable. From the point of view of the company's office, there should be no such thing as an unreasonable complaint. It is safe to say that no man will take the trouble to walk to the office and lodge what he knows to be an unreasonable complaint; it must seem reasonable to him, and it is the customer's point of view that the front desk man must learn to acquire if he would succeed in his work. If the complaint is in reality unreasonable, the man at the desk should have no difficulty in tactfully satisfying the consumer of the error.

The complaint desk man should not permit the consumer to believe that the company regards the matter as a complaint at all, but rather as an opportunity to improve the service, and as such, impelling a sense of obligation for a favor conferred. In order to handle a complaint intelligently and without undue delay, the office man must have an intimate knowledge of the workings of the different departments of the business. This will enable him to locate the source of the trouble immediately, and to put the matter in the proper channel for prompt and careful attention. Oftentimes a complaint springs from ignorance or thoughtlessness on the part of the consumer; he may be, all unwittingly, wasting gas in any one of numerous ways, or through some defect in his equipment not receiving the maximum amount of efficiency of which the appliance is normally capable. He may even be holding the gas company to account for something over which it has no control. A general knowledge of gas appliance and their gas consumption, together with such shop details as make for a perfect installation, will enable the company's man to arrive at a pretty fair idea of the amount of gas consumption to be expected in the consumer's home, and his proficiency along this line may enable him to satisfy the consumer before he leaves the office.

There are other sources through which complaints may reach the company besides the personal interview at the office. These may come by mail, by telephone, or, indirectly, by messages sent through other company employees. Complaints that arrive by mail should be immediately acknowledged, and passed over at once to the head of the proper department for attention, and should be carefully and systematically followed up until the consumer has been entirely satisfied. Complaint by telephone should receive the same prompt and intelligent attention as when dealing with a complaint by personal interview, with some additional points to be remembered, calling for extra help. The message should be received by some responsible man, not by the office boy or some person in a subordinate position; complete attention must be concentrated on the matter in hand in order to hear correctly and avoid annoying the consumer and wasting his time by asking for repetition. In talking through the telephone, the voice should be at ordinary conversational pitch, words should be clearly and distinctly enunciated, and the tone must carry conviction. In other words, the man at the other end of the wire must not get the idea that there is any doubt in the speaker's mind. It must always be borne in mind also that the listener has only the words uttered, and the tone of the voice as it is conveyed along the wire, by which to form an opinion; there are absent from such a conversation the gestures, facial expression and the personality of the speaker, all of which weigh so much in a face to face talk. Many consumers send complaints through the medium of other company employees, indexers, collectors, fitters, etc. Some of these complaints reach their destination promptly, some are held up through various causes, some are never turned in at all. The bringing in of a complaint at a belated date, even if it receives immediate attention at the office, creates a bad impression of the company in the mind of the consumer. The company gets the name of being dilatory, or what is still worse, of being indifferent, and the company has no redress, for it cannot defend itself by reason of the fact that the fault lies with its own employees. Matters are much worse where the complaint is side-tracked and never turned in. Such a possibility could be prevented if all employees were furnished with forms to use when they receive a complaint, and if, at the close of each day, the head of every department whose men rub elbows with the public, should ask for such forms from each and every such man.

Among the various complaints lodged, perhaps those known as "high bill" complaints are the most numerous; they are frequently accompanied by a demand that the gas meter be changed. The man at the complaint desk should be thoroughly versed in the mechanism of the gas meter, and should be well informed as to its accuracy. He should know that in practically no cases is the high bill caused by the gas meter, with which knowledge, and by having recourse to the putting of certain tactful questions, he is very apt to discover some cause for an excessive use of gas during the period covered by the bill. Such things frequently have slipped from the mind of the consumer, and when, by dint of the questions asked him, they are recalled, he will depart convinced that the bill is a fair one. The inclination of the unskilled or careless clerk is to take the easiest channel to get rid of the complaint, and throw the onus on to some other department, and the easiest or simplest way seems to be to order the meter changed; this, as a rule, will get rid of the consumer for the time, but in no way solves the problem of the complaint, and we would advise against anyone at the front desk suggesting the changing of the meter until all information has been looked into and digested.

What has been said about the receipt of, and attention to, complaints is equally applicable to orders and their diversion into the proper channels to ensure quick and correct attention. In whatever way delivered, the man receiving orders should inform himself of and record clearly and intelligently all the detail necessary to the rapid and accurate filling of the same, on the first interview. This saves delay in completing the work, lets the customer see that the order is appreciated and obviates the necessity of a second interview over a matter of which he had considered himself relieved.

The order clerk should be always on the lookout to save the time of the consumer, and to save time and labor on the part of the company; to this end, the gaining of all specific information with every order is essential. For instance, if the work is to be done in an apartment house, the particular floor and exact location of the work must be asked and noted. Many companies supply gas to sparsely settled districts where the houses are not numbered; in such cases it would make it easier for the man going on the work, if there were noted on the order, some landmark or at least if the compass direction were indicated, or, as far as possible, the approximate distance from other places were stated. When the fitter goes to do the work he should be primed with all such details; otherwise he may be obliged to make several unnecessary trips to and from the shop, at needless expense to the company.

The front desk man should be on good terms with the heads of all the departments in order to secure the best co-operation; he should understand all about the operations of the shop, that he may be able to judge the sort of attention an order will receive and form some idea as to the time that will be required to make the installation or perform the work called for by the order. He should carefully avoid making definite promises as regards the filling of orders. It is recommended that where practicable, a working schedule be laid out and a copy of it kept within reach of the complaint, or order desk man, by which he can tell approximately when orders of certain classes can be reasonably expected to be completed. In any well regulated distribution department the average time for executing orders can be pretty closely standardized. With regard to orders that are pending, it would be well to maintain a file, by reference to which the order clerk could ascertain immediately, the reason why certain orders have not been filled, and also derive an idea as to when they will be filled, all of which information may at any time be sought by a consumer, and a rapid, reliable answer from a handy file will please the man who thus sees that careful attention is being given to his order.

The complaint desk man should also carefully review all completed complaint orders, with a view to finding out whether the fitter has correctly construed and handled the complaint, and for other reasons. Occasionally a fitter will record on his completed complaint order form information concerning other work which the consumer has wanted done, and for which the fitter has advised him to go to the plumber or someone else, when the doing of it by the company would involve but small expense and would gratify the consumer considerably. Such a review carefully made, together with a daily and monthly summary of complaints, would give the complaint clerk a good opportunity to get a line on the departments where the responsibility lies and bring about the elimination of many complaints.

We have said that the Order and Complaint Department employees should be intelligent, well versed in the company's business, of good appearance, etc., but he should also be a man of experience, one who has a broad knowledge of human nature and the ability to size up other men; he should be at all times most considerate of the other man, and remembering that in most cases, to the consumer, he represents the company itself, should never for a moment forget the responsibility this entails; for, so far as these people are concerned, the company will be judged absolutely by the opinion they form of him, the company's representative.

The Welfare and Training of Employees.

[Paper by O. L. PALMER, to the Michigan Gas Association.]

The atmosphere of the industrial world is thoroughly permeated at the present time with the spirit of paternalism, the apparent thought being to care for the body, soul and spirit of all those touching in any way the business in which the organization is engaged.

One great corporation goes into the homes of its employees advising in regard to conditions there, follows the inmates of the homes to work, to play and to recreation, insists on knowledge of not only present conditions, but of antecedents, and having formed a conception of what an American citizen employed by it should be, proceeds to lay out the future of its dependents in accordance with this conception. Individual effort is rewarded, but it must be directed along the lines laid down by the corporation. Another company goes so far as to plan the houses of its employees, and prescribes the extent of the lawns surrounding them, looking, of course, to the uplift which must attend the living in well-ordered homes, under well-advised management. Some organizations in this city are maintaining schools that teach methods and procedures adapted to their own immediate needs. There is a movement on foot at the present time to provide instruction in English to all foreign elements of our city, the work to be carried on through our public schools. These and a hundred other well meant efforts are being put forth to increase the efficiency of our great army of workers and laborers, whether in the office, at the bench or in the ranks of common labor. Paternalism, carried to an extreme, is likely to degenerate into "fadism;" and when welfare work or training development become merely an outlet for some fad or fancy held by an organization that has sufficient power and resources to carry it out, then individualism ceases to thrive, and the outcome must necessarily be far from that desired.

The Detroit City Gas Company looks at this problem as it looks at any other business problem. The company is in business for one purpose and one purpose only. Whatever will bring about the best results in attaining this purpose is promptly accepted and all other attempts are forgotten as speedily as possible. We believe it takes ordered brains to successfully carry on the gas business, and for this reason they are doing some things in a small way to educate our employees up to the standard that we believe the business requires.

The schools in our city are good; they give to our young men and women a foundation intellectually, which very well fits them to take up the avocations they may choose. But we find that the great majority of those who come to us have finished the eighth grade only, and still have a good deal to learn. So our problem stands out plainly. If we keep these young people on our payroll they must be broadened; their intellects must be trained by us. In a word, we want them to think, and think rightly, on more things than simply the making and marketing of gas. To this end we say to them, "Study something, anything, so that you are improving yourselves, and we will pay the bills."

This is no humantarian scheme born of benevolence, but is a cold-blooded business proposition. We want the best person we can get for every position in our company, and we want that best person at his best all the time. In this we do not differ from other companies; so being agreed, we are up to the question, How shall we proceed? How shall we go in promoting the welfare and supervising the training of our employees?

The State of Michigan has provided a channel through which we can direct our efforts for the welfare of our employees. The Michigan Employers' Liability and Workmen's Compensation Act clearly defines what must be done in the case of an injured employee, but if we stop with the fulfilling of the provisions of this law, we will have done but little. There is always opportunity for us to see where we may do more in such a way that it will be a lasting benefit to the recipient, and the influence will be ever reaching out through the medium of his immediate circle. Sometimes money will be needed; but more often a word of sympathy or of kindly advise will be of more lasting benefit than anything that can be bought.

We foster the idea that our employees constitute a large well-regulated family, no member of which can suffer without all of the family being affected. While all departments are absolutely distinct, and the functions of each department well defined, yet as one we are working for the common interests of all. These interests are not bounded and circumscribed by the round of daily toil. If some of our employees are not up to the mark there is a reason, and in some quiet and unassuming way we endeavor to find out the reason, and then, if possible, apply the remedy suited to the case.

During the past year we have held, on the third Wednesday of each month, what we call Employees' Educational Meetings. We serve a light lunch from 5:30 to 6:30, and the hour is a most enjoyable social occasion. From 6:30 to 7:00 the meeting is in charge of some one department of our work. On one evening we demonstrated the usual faulty burners found by our trouble men in the Range Department. Faulty burners were shown in operation, and the faults corrected. On another evening our Street Department had charge, and the work was of such interest that another evening was given to this department, at which a very interesting discussion of electroylsis took place. On another evening our advertising department had charge of the meeting and gave us a drama from the trials and tribulations of one Mr. Jones who wanted his. This work was not only instructive but quite amusing. At these meeting we have talks by the executive officers of the company, or addresses from prominent business men, etc.

In addition to these general meetings, the various departments have regular meetings for the discussion of topics pertaining to their immediate business.

During the year we have had employees taking courses as follows: In the N. C. G. A. courses, course 3, and the 3-years' course; in the Detroit Technical Institute, courses in credits, sales, business, English, arithmetic accounting, plumbing, gas fitting, automobile and gas engine.

For all these we pay the tuition, charging it to the employee and deduct it from the payrolls in small amounts; and when a certificate is furnished that the work has been completed in a satisfactoty manner, we pay the money back to him.

Our way of conducting this important part of the work of any corporation may not be the best way, but we have certainly seen only good results, shown in better attention to the business in hand and a broader, more comprehensive view of the whole business by every employee; and it is paying for all the time and effort put into it.

If, in each of the companies represented at this meeting, there was a class taking the 3-years' course of the National Commercial Gas Association, the results would be very great upon the standing of the industry in Michigan. The men taking the course would soon have a broader outlook, because they would find that the business in which we are engaged is a bigger business than they had supposed. As soon as a man realizes that his job is a big job, no matter how commonplace it may appear, he begins to grow up to the measure af that job. And we will never be able to get big men enough, to say with a surety that they have outgrown the big business of making and marketing gas in Michigan.

An Attractive Window.

During Gas Lighting Week "down in Dixie," the Athens Gas Light and Fuel Company's office had one of the best window displays of gas lighting shown in the entire country.

The photograph reproduced here, while a good "still" picture, does not give one an adequate idea of a display. The chief attraction was the 6-foot revolving gas-lighted "umbrella" in the center of the window. The cover of the umbrella was of galvanized iron, the top painted green, and the under side enameled white. The "ribs" were of bronzed pipe, and at the end of each of them was one of the new Humphrey Radio-X gas lamps, and a Welsbach semi-indirect fixture answered for the umbrella handle.

The umbrella was suspended on a regular gas ball-joint, and the weight of the structure (65 pounds) was nearly all taken off the joint by means of a ball-bearing cup, supported from above the ball-joint and screwed up to the bottom of it to receive the weight, and leave the regular ball-joint practically free of strain and easy to turn.

A worm-gear, with pulley attachment, driven by a very small water motor, caused the umbrella to make $3\frac{1}{2}$ revolutions per minute, and all the while it was turning, the gas lamps on it burned brightly.

People looking in from outside the window, wondered how it was done, and even college professors came in to ask how the gas was supplied, and why the lights burned without flickering.

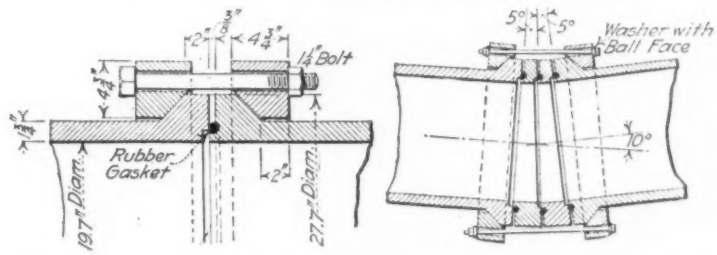
The local paper published an article headed in black type, "Gas Company Invents Revolving Gas Light," and much good publicity was gotten from the display.

Underneath the umbrella, gas lamps, with different kinds of shades were strung along the "fence" and kept lighted during all of Gas Lighting Week.

Many Athenians congratulated genial A. C. Turner, the Manager, on such a splendid window, but Mr. Turner gives the credit for the window to his Superintendent, George W. Joiner, who is a genius at mechanical window displays.—E. D. B.

New Methods and Appliances.

PIPE JOINT FOR VERY HIGH PRESSURE.—A joint designed for working pressure above 2,000 pounds, is shown in the cut.



This joint was successfully used in a penstock carrying water under a static head of 5,412 feet. The inside diameter of the pipe is 23.6" in the upper part and 19.7" lower down. The wall thickness varies from $\frac{1}{4}$ to $1\frac{3}{4}$". Welded pipes was used for the upper portion and seamless drawn pipes for the lower sections. In order to keep the weight of each section of pipe as near as possible to 4 tons, the lengths were varied in 3-foot steps from 20 to 40 feet. At the power house, where the pressure is heaviest, there are 56 pieces each 20 feet in length, with a wall thickness of $1\frac{3}{4}$".

Each end of a pipe section is provided with conical flanges, over which fits chambered rings held together by bolts. Each ring is split in halves and the sections bolted together. Tightness is insured by a rubber gasket ring of circular cross-section.

At points where the pipe line was deflected, either in the horizontal or vertical plane or in both, the angle was made by inserting joint rings with inclined faces. The angle between the faces of a ring is 5°. By using two rings and rotating them in respect to each other, any angle from 0 to 10° was obtained. By using several rings any desired angle within reason could be joined.

TIME IN MIXING CONCRETE.—"The hydration of Portland cement and its subsequent 'setting up' is at best little understood, and chemists are still investigating what takes place subsequent to the addition of water to cement, and what are various conditions affecting it," said H. H. Scofield, Purdue University, at the Indiana Engineering Society Convention.

Commercially, every engineer and builder is vitally interested in the conditions that affect the hydration of cement. The effect of fineness of the cement, quantity of water used in mixing and the amount and kind of mixing itself, together with the placing and treatment of the concrete after the mixing are questions that affect everyone interested in the production of permanent concrete.

The desire to make speed—to put another story on a building in fast time, to lay another mile of concrete road in half the time the last one was laid, to build more this month than last; these and other reasons seem to make it necessary, commercially, to build the so-called efficient mixing plants and to turn out batches of concrete at the rate of sometimes seventy batches per hour. The writer has timed a mixer on commercial jobs operating at this rate of speed. He has even timed a batch mixer on a commercial work when the elapsed time from the introduction of the materials for one batch to the introduction of the materials for the next was 28 seconds. This running a batch mixer nearly continuously is by no means uncommon.

The effect of this rapid mixing could probably be minimized if it were known that all other deteriorating influences were absent, but taken in addition to a possible unsound cement, a poor aggregate, "skinned" proportions, excess of water, low temperature, etc., rapid mixing may become a very important contributory cause of poor concrete.

The purpose of mixing concrete is two-fold; first, by a thorough stirring-up, and abrasion one particle upon another, the solids are properly arranged and mixed; second, by the addition of water, the hydration of the cement should be accomplished. The first, to be effective, must be done without separation of sizes, and any fine dust or clay already adhering to the aggregated particles should be abraded away and replaced with cement. The second requires a working of the mass to insure the complete wetting of the cement and the consequent bringing out of the colloidial state upon which the hardening and strength of cement depend. The complete operation must take some time. The amount of time depends upon many conditions, some of them, of course, being peculiar to the work and to the available materials.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

CHIEF ACCOUNTANT, Henry Willmering, of the Oklahoma Gas and Electric Company, has devised a "Baby Bond" certificate that promises to avoid meter deposit difficulties and still guarantee payment of bills. The certificates have the appearance of standard bonds, and have attached coupons calling for the annual interest, which are negotiable on their due date when signed by the original owner. As is customary, where service is secured in the name of the property owner, no deposit is required, but where this is not the case, one of the "Baby Bonds," in denomination of $5 or $10, are issued in exchange for the customer's deposit. Besides simplifying the clerical work, it is said to have met with great favor with the public.

HELLERTOWN, Pa., is to get gas from the Allentown-Bethlehem Gas Company.

OWING to the dim lighting in London, the police in charge of traffic have been equipped with warning lamps fastened to their backs.

A SUGGESTION of the Kansas City (Mo.) Gas Company, that a shortage of natural gas this winter could be avoided by furnishing manufactured gas to the north part of the city, has brought forth a flood of protests. Mayor Jost recently notified the gas company that the city would expect it to exercise every means in its power to give consumers an adequate supply. Although the idea of bringing manufactured gas to the aid of the natural fuel in times of need during the winter was looked upon with favor, the city would not listen to $1 gas for one part of the city while another and richer part of the city had the advantage of low priced gas. The idea advanced was that in case it became neceseary to shut off the northeast part of the city from natural gas and supply it with the manufactured product, the whole city would have to bear the burden of the increased cost.

THE St. Paul, Minn., City Council has awarded the contract for maintaining 5,000 street gas lights for two years, to the Patterson Street Lighting Company at $10.50 a lamp a year. The first bid of the company, which owns the lamps now and has the initial advantage over any possible competitor, was $11 per lamp. The Public Lighting Service Corporation, New York, bid $10.65 a lamp on a two year's contract, but this bid was found to be illegal. The Patterson Company later wrote the Council offering the new price of $10.50.

OPERATION by its purchaser at the sheriff's sale of the Dover, Rockaway and Port Oram Gas Company has been promised by Edwin Hawley Van Wyck, of Cranford, who bid $110,000. The sale was made on the suit of the Fidelity Trust Company of Newark, N. J., trustees of the first mortgage bondholders, and the bid is not quite sufficient to pay the amount of the judgment degree and expenses, which total $110,270.94. The sale at the suit of the second mortgage bondholders was deferred for a week by Special Master Willard W. Cutler. Mr. Van Wyck is a member of the firm of P. W. Brooks & Co., bankers and brokers of New York, who are representatives of the second mortgage holders. He asserted, after the sale, that he bought the property, not as a member of the banking firm, but as an individual, and that he would himself operate it. It was rumored that the real buyer was the Public Service Corporation, and this was strengthed by the waiving by the Fidelity Trust Company of insistence that 10% be paid on the spot to bind the purchase. There was also some talk, that Mr. Van Wyck represented the firm of Barstow & Co., or other interests identified with the Atlantic Gas and Electric Company, and its subsidiary, the Eastern Pennsylvania Power Company.

THE question of the right of the Washington Gas Light Company and the Georgetown Gas Light Company to deduct the cost of raw material from their gross receipts, to arrive at actual earnings, will be taken to the Court of Appeals by the District of Columbia. Judge Gould decided the companies have this right and that they were entitled to recover from the District of Columbia the excess taxes required of them by the assessor, who charged the tax on the total receipts of the companies. In rendering the decision, the Justice overruled the demurrers of the District of Columbia, and rendered judgment against it. Judgment in favor of the Washington Gas Light Company was for $31,321.62, and for the Georgetown Gas Light Company for $3,241.49.

ONE result of the annual fall moving period in New York city, and the return of city residents from the country, was the presentation to the Consolidated Gas Company of 287,656 orders of various kinds from its consumers in twenty-nine days; an average of 10,000 orders a day from September 13 to October 16. Of these requests, says "Gas Logic," for November, 54,874 came from consumers who wanted meters installed or unlocked. As evidence of the moving about of residents of Manhattan and the Bronx about October 1, the gas company's records show that for the twelve days, September 27 to October 9 inclusive, 26,770 meter orders were received. During the same period 20,409 applications for gas were received; 19,280 meters were removed from premises or locked, and 1,836 meters were exchanged at the request of consumers. So a total of 68,385 gas meters had to be dealt with in twelve days. On October 1 and 2 meter orders numbered 10,594.

THE Stacey Brothers Gas Construction Company is erecting a $100,000 plant on Carthage avenue, St. Bernard.

THE matter of a gas franchise in Estherville, Ia., will soon be up to the people of the city. Messrs. Summers and Jackson, who are asking the right to put in the plant, were present at the City Council meeting, and the matter of giving the city 1% in place of ½% was finally agreed to, after the plant had been in operation for a period of six years. The rate proposed is what other places obtain, and the company agrees to have the plant in operation within eighteen months, the streets are to be left in good condition, and the pipes placed as the city desires.

THE Brazil, Ind., city council passed a motion inviting the Brazil Gas Company to submit a proposition for illuminating National avenue with cluster lights, on the expiration of the T. H. I. and E. Company's contract.

MAYOR CARLSON, of Moline, Ills., says that the Moline city council received assurance several months ago that the People's Power Company intended, within the coming year, probably some time this winter, to reduce gas rates in both Moline and Rock Island. Consumers in Moline are now paying $1.10, and according to assurance given the city council, the company intends cutting this rate 10 cents, furnishing gas at $1, with the regular 10% discount for payment within 10 days. The matter was put up to Mayor Carlson following an announcement from Rock Island that the council there is considering an ordinance to force the company to lower rates by January 1. No such action is contemplated by the Moline council, as they feel that since the company is willing to make a voluntary reduction, there is no necessity for taking action that would make it appear that the council is forcing the company to do something it intends to do.

THE Massachusetts Gas and Electric Light Commission has issued an order authorizing the Taunton Gas Light Company to do business in the towns of Norton and Mansfield. It is already supplying the town of Raynham.

THE Sheboygen (Wis.) Gas Light Company will put into operation on December 1, a continuous meter reading and discount service. The city will be divided into a number of districts, and all meters in each district will be read on an appointed date each month. The bills will be made out the following day and delivered the next day by a collector, to whom payment may be made if desired, and discount will be allowed 10 days from date of the bill. For example, the meters in District No. 1 will be read on December 1st, bills figured on the 2nd and delivered on the 3rd. In this case the bill will be dated the 1st, and the last discount day will be the 11th. Meters in District No. 2 will be read on the 2nd, figured on the 3rd and delivered on the 4th, the last discount day being the 12th; and so on through the month, until the meters in each district have been read and bills delivered.

THE sliding scale of gas prices such as in force in Boston is so equitable to company and consumers, that at the hearing before the Massachusetts Public Service Commission of the application of the Bay State Railway, for permission to raise its fare to 6 cents, it has been suggested that the rate of fare be made dependent upon the dividends paid on stock. Such a system has been inaugurated in Cleveland, and is proposed for Toledo.

THE biggest tax bill of the year in Revere, Mass., is that of the Suburban Gas and Electric Company, which now pays the city $3,000 more in taxes than it costs to light the city. The 1915 tax was $19,354.36.

THE New Jersey State Board of Public Utility Commissioners has suspended a proposed increase in rates of the Wildwood Gas Company, at Wildwood, Cape May county. The company proposed to put into effect as of November 1 a rule requiring each customer to pay $1 for having gas turned on, and an additional $1 for each customer using gas and ordering it discontinued and turned off.

JOHN W. FALLON, popularly known as "Jack," an employee of the Lawrence (Mass.) Gas Company for the past 28 years, and a well known figure in New England sporting circles, passed away Nov. 5th, at his home, 145 Maple street. He had been in failing health for some time and had returned home after spending several weeks in Detroit in an endeavor to regain his health. He was well liked by his employers and co-workers. He was a charter member of Lawrence aerie, 216, Fraternal Order of Eagles; was a long time follower of the fistic sport, and had achieved a high reputation as a trainer and developer of boxers.

A RESOLUTION has been introduced in the city council for the city of Chippewa Falls, Wis., to purchase its public utilities consisting of the electric light, gas and water plants from the Wisconsin-Minnesota Light & Power Company, by issuing $150,000 in city bonds and the balance to be paid by mortgage certificates. The resolution is to be acted upon at the council meeting Dec. 21.

RIGHT to extend its mains 500 feet beyond the city limits on the Bayshore Boulevard has been granted the Tampa (Fla.) Gas Company by the Board of County Commissioners. The company contemplates serving a number of new customers in that section, in which the population is increasing rapidly. Bond of $1,000 was required to guarantee that it replace all paving removed in a satisfactory manner.

CHARLES B. BETHUNE, receiving teller of the Essex Trust Co., Lynn, Mass , has been elected assistant treasurer of the Brockton Gas Light Co., and has severed his connection with the banking institution. This is the second official of the Essex Trust Co., to be selected as treasurer of a gas company, the first being Eugene B. Fraser, treasurer of the Lynn Gas and Electric Co.

THE Duluth, Minn., Water and Light Department claims to have saved $8,000 a year by establishment of 10 pay stations, and the plan of continuous reading of water and gas meters. The department itself is saving annually $5,000, and consumers are saving $3,000 by the innovations, according to the bulletin mailed consumers with their gas and water bills. The practice of continuous meter reading and continuous billing was began Jan. 1, 1914, the city being divided into districts, each with its separate days for payment. "A trial of nearly 2 years has demonstrated the absolute practicability and the great economy of the scheme," reads the bulletin.

UTILITIES COMMISSION NEWS.

RATES DIFFERENT NOT NECESSARILY DISCRIMINATORY.—Upon an opinion by Commissioner Devoe P. Hodson, the up-State Public Service Commission has again called attention to a difference in rates which is not discriminatory under the law nor unjust or unreasonable in themselves, the Commission dismissing the complaint of residents of the town of Chautauqua, Chautauqua County, asking that the South Shore Natural Gas and Fuel Company be compelled to reduce the price for gas to the same amount charged in neighboring communities.

Commissioner Hodson points out in his opinion that the complainants have introduced no testimony in their case to show that the rates complained of are in themselves unreasonable, or that the lower rates in the adjoining territory are fair and reasonable, in accordance with the recent decision of the Court of Appeals in the New Haven commutation cases and other cases in the courts and before the Commission.

The complainants are residents of a rural section along the Portage Road, between the villages of Mayville and Westfield, and pay a net rate of 50 cents per 1,000 for their gas. In the village and town of Westfield the price of gas is limited by the company's franchise to a net price of 35 cents. In the village of Mayville the franchise provides that 50 cents may be charged after a period of years at the 35 cent rate. The opinion points out that the rural sections of the town of Westfield is the only part of the town comparable with the territory of the complainants.

"The restrictive rates contained in the Westfield franchise," says Commissioner Hodson, "are not voluntary charges made by the company in the exercise of its functions as a public utility, but are, on the contrary, the arbitrary terms imposed by the town, perhaps as a partial compensation for the use of the highways, but without any apparent consideration of the value of the service involved, and a rate thus fixed cannot be treated as a standard for regulating rates for service elsewhere."

Citing cases previously decided by the Commission and upheld by the courts, the opinion further says:

"These cases uphold the principle that gas and electric companies are not prohibited by the law from giving a preference to particular persons or a certain locality, and thus discriminate against other persons and localities; and it is only when such preference is undue or unreasonable, and the discrimination is unjust, that the Commission may intervene and correct such practices. This must be determined by the facts and the circumstances of each case as they may be presented, and no general rule may be stated which will always apply."

"The respondents" (the company), the opinion concludes, "did furnish some evidence tending to show that the ratable expense of service in the sparcely settled country districts, with their half dozen customers widely scattered, is greater than it is in the villages, where there are hundreds of gas users—and this, of course, must be true."

COURT ORDERS REFUND OF INCOME TAX TO OHIO UTILITY COMPANIES.—Verdicts were rendered by consent in the United States District Court at Cincinnati on Oct. 14 by which a number of electric railway companies and the Cincinnati Gas and Electric Company will be refunded the income taxes paid to the Collector of Internal Revenue, amounting in all, with interest, to $52,818.33. These companies lease their properties to operating companies and contested the claim of the government that they are obligated to pay this income tax when they performed only such acts of business as were necessary to carry out the terms of their leases. The verdict in the United States District Court was against them, but it was reversed some time ago by the Appellate Court and the case remanded to the District Court with instruction to render judgments for the amounts named: Cincinnati Gas and Electric Company, $35,627.58; Cincinnati Street Railway Company, $11,926.60; Indianapolis, Columbus and Eastern Traction Company, $2,986.56; Columbus, Newark and Zanesville Electric Railway Company, $447.66; Fort Wayne, Van Wert and Lima Traction Company, $538.20; Dayton and Western Traction Company, $977.67, and the Columbus, Newark and Zanesville Electric Railway Company, $313.96.

CALIFORNIA DEVELOPMENT.—The Railroad Commission of California has published a report outlining the public utility development work in that State since the Commission assumed jurisdiction over stocks and bonds, covering the period from March, 1912, to September, 1915. During this time stocks, bonds, notes and certificates have been authorized by the Commission amounting to $466,000,000. Of this amount, $175,000,000 was for the payment of maturing debts; $248,000,000 for new construction, additional development of existing utilities and new ventures, and the balance to be used for miscellaneous purposes. The authority for improvements was distributed as follows: Steam railroads (including $25,000,000 for expenditures outside of California), $102,800,000; electric railroads, $32,500,000; gas and electric companies, $80,000,000; water companies, $18,500,000: telephone and telegraph companies, $2,500,000; warehouses, $1,600,000; pipe lines, $10,000,000. Approximately, $200,000,000 of the foregoing has already been expended, or is in the process of expenditure. During the $3\frac{1}{2}$ years under review there were launched 16 new railroad enterprises, 13 new gas and electric companies, 6 new telephone companies, a new $5,000,000 oil pipe line, an independent ferry line on San Francisco Bay, and many new water companies. Seven hundred miles of new railway lines have been constructed or are now under construction, and water power projects involving the development of a total of 100,000 h.p. have been undertaken.

Financial Notes.

THE California Railroad Commission has issued a supplemental order authorizing the PACIFIC GAS AND ELECTRIC COMPANY to reimburse its treasury $1,447,500 from the sale of certain bonds and stock, the money being used for plant expenditures, and to issue first preferred stock up to March 1, 1917, instead of being limited to November 1, 1915. On July 1, 1914, the company was authorized to issue $12,500,000 first preferred stock at not less than 82½% of par. The commission's order provided that no stock other than first preferred, which was to be exchanged for ordinary preferred stock, should be issued after November 1, 1915. The company reports that up to October 25, 1915, it has received on account of stock subscriptions $9,842,032.50. It sold its first preferred stock at $82.50 until June 26, when $85 was obtained, and on October 1 the price was raised to $87.50. Some subscriptions will not mature until January 1, 1917, and the company will have to issue first preferred stock up to March 1, 1917. The first of this year the company was authorized to sell $5,000,000 general and refunding bonds at not less than 85%. These were pledged to secure in part $4,000,000 one-year gold notes. The commission specified that the money from the sale of these bonds must pay these gold notes or be spent for capital purposes. The $4,000,000 gold notes have all been paid; with $2,552,500 received from the sale of $3,000,000 face value of general and refunding bonds and by $1,447,500 from its treasury. The company reports uncapitalized expenditures to August 31, 1915, of $4,706,618.23 and estimated expenditures of $3,150,000. Among the larger sums yet unexpended, but itemized, are:

Extension of Cordelia-San Rafael tower line from Schuetzen Park to Station F, San Francisco	$273,942.42
Eight-inch pipe line six miles long, to supply peninsula	47,938.16
Eight-story office building in San Francisco	113,283.25
Concrete dam and spillway to increase storage capacity of Lake Spaulding	703,116.27
To increase Drum plant	565,209.78
Construction of three power houses	1,410,976.48
Three steel tower transformers on line from Drum power house to Cordelia	566,229.99
Building sub-station at Cordelia and line to ridge sub-station	203,621.72

AT their present level, the first consolidated mortgage 5% bonds of the NEW AMSTERDAM GAS COMPANY yield 5%. The company is controlled by the Consolidated Gas Company of New York, and while the bond is not guaranteed by the parent company, it is virtually a guarantor, for the franchises of the New Amsterdam company are too valuable to let go by default. As a matter of fact, the New Amsterdam is capable of standing on its own feet, as a basis of investment. It consolidated the New York and East River Gas Company and the Equitable Gas Light Company in 1898, and supplies that part of Manhattan between 135th street on the north and Canal street on the south, and distributes gas in Queens, Long Island City. In 1914 its gross revenue was $2,923,000. While the company has shown a consistent deficit, year after year, it appears only after renewals and contingencies. Subject to $8,500,000 of prior liens, these bonds are secured by a mortgage on all the property of the company. They mature in 1948.

THE CONSOLIDATED GAS, ELECTRIC LIGHT AND POWER COMPANY, Baltimore, Md., is arranging to have its stock listed on the New York Stock Exchange. The stock is listed in London, but the war has checked operations there and has made the foreign holders more inclined to sell than to buy. Baltimore has absorbed the stock very freely and it is said will continue to do so, but the company and its operations are becoming too important to have the trading in its shares circumscribed to the domestic market where it is now active.

THE changes in gross earnings and other items of the operating companies owned by the COMMONWEALTH GAS AND ELECTRIC COMPANIES for September, and three months ending Sept. 30, 1915 and 1914, are as follows:

	1915.	Increase	P. C. Inc.
September	$19,566.40	$1,274.71	6.97
Three months ended Sept. 30	56,397.57	4,583.12	8.85
Number customers, Oct. 1	6,588	597	
Connected motor power	1,497.5	541.5	

THE New York, New Haven and Hartford Railroad Company has made application to the Connecticut Public Utilities Commission for permission to acquire stock of another public service corporation. The application is a petition to be allowed to subscribe as a stockholder and to receive and hold its stockholders' proportionate share of certificates of new stock to be issued by the WATERBURY GAS LIGHT COMPANY. The railroad company at present controls the Waterbury Company. It is the intention of the latter to increase its capital stock from $1,000,000 to $1,500,000, and in order to to protect its interests, the company finds it necessary to be allowed to subscribe for its pro rata share of the new stock.

SEPTEMBER earnings of the subsidiaries of the CITIES SERVICE COMPANY in different sections of the country, show appreciable increases. The Denver Gas and Electric Light Company registered a gain in net for the 12 months ending Sept. 30, 1915, of nearly 15%, or over $200,000,

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